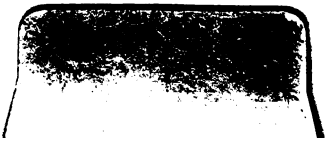
TEACHERS' HAND-BOOK

TO THE

WERNER ARITHMETICS

FRANK H. HALL



HAND-BOOK

FOR TEACHERS USING

THE WERNER ARITHMETICS

WITH

ANSWERS TO PROBLEMS IN BOOKS II. & III.

BY

FRANK H. HALL

When a new and difficult subject is to be presented to young pupils, make the first *language approach* by way of the ear and not by way of the eye.

(SEE STEP I, PAGE 10)

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PREFACE.

This book is designed mainly for the use of the teacher *in the schoolroom*. It should be given a place on the teacher's desk, and, with no attempt to conceal the fact of its existence, should be freely consulted as occasion may require. At the "recitation hour," written work previously done by the pupils, should be quickly disposed of by comparing the results obtained by the pupils with those given in the Hand-Book. If the requirement includes the finding of the sum of eight or ten results, as is often the case in Book III. and in the Supplementary "Seat Work" in the Hand-Book, this sum should be first examined.

Each pupil should be encouraged to acquire that degree of concentration and care that will enable him to secure accurate results on first trial, or at least before his work is compared with that of any other pupil, or with the answers given in the Hand-Book.

It is believed that the proper use of the Werner Arithmetics, together with that part of this book in which the answers to problems are given, will enable the teacher to spend less time than formerly in the mere hearing of recitations and in the explanation of problems, and much more time in the actual teaching of mathematics—in leading the pupil to see the relations of measured magnitudes, and, in arithmetic as elsewhere, to "learn to do by doing", and to *learn to think by thinking*.

F. H. H.

JACKSONVILLE, ILLINOIS, January 9, 1899.

CONTENTS.

THE WERNER ARITHMETICS.

BOOK I.

Pages 6 and 7.—These pages contain the number facts and terms that should be taught orally to pupils before attempting the work given on the pages that follow. Much of this knowledge may come to the pupil incidentally before entering school and during the first two years of school life.

It is not deemed advisable to commence the formal mastery of these pages before the last third of the second school year, and little time will be lost if this is not attempted until the beginning of the third year.

During the first two years of school life the arithmetic exercises may be such as are suggested by what Dr. John Dewey has very happily called "Related Number Work", the object of which he holds to be developing a "number sense." The primary teachers of the public schools of Austin, Illinois, some months ago, supplied to their superintendent, Mr. N. D. Gilbert, much suggestive material for work of this kind. After a discussion of this material, Dr. Dewey suggested this outline: I. Administration; II. Science; III. Construction; IV. Plays and Games. Mr. Gilbert arranged the material into the outline here reproduced by his permission. This is intended only to be suggestive of the abundant practicable material close at the teacher's hand.

Related Number Work.

GRADES I. AND II.

I. ADMINISTRATION.

1. *Attendance;* counted by ones, twos, etc., and by unequal addends.

How many boys present in Row 1? How many girls present in Row 1? How many pupils present in Row 1? How many pupils in Rows 1 and 2? In Rows 2 and 3? How many boys absent? How many girls absent? How many pupils absent? How many boys present? How many girls present? How many pupils present? How many pupils belong in school? How many present? How many must be absent?

2. *Distribution of Material.*

(*a*) A monitor comes to teacher from each row. How many sheets of paper (pairs of scissors, pencils, books, etc.) do you need? Teacher gives him some. How many have you? Is that as many as you need? Do you need as many as that? How many more do you need? Return to me all you do not need.

(*b*) Child goes to the supply and counts for himself, under the teacher's eye, what he needs. Encourage the child to count not only by ones, but by twos or by threes or by unequal addends.

3. *Reading.*

Find the page by number. Find a line on the page or a word in the line by number. Find a given word (on which drill is being given); find it again; again. How many times does it appear on the page? Group words phonetically. How many in each group?

II. SCIENCE.

1. *Weather Record.*

Days and dates. Find date by addition from day to day—Friday to Monday. Character of weather denoted by discs of colored paper, using half and quarter discs to denote changes during the day. Number of clear, cloudy, rainy, etc., days in the week; in the month. Comparisons; averages. Prevailing winds; how many days was there a west wind? north? north-west? south-west?

2. *Thermometer.* Children taught to read it.

Represent the thermometer scale: On blackboard, 1 in. equal 2 degrees; on paper, 1 in. equal 10 degrees. Represent five scales side by side on one sheet; mark daily readings; at end of week connect points of daily marking, thus giving a graphic representation of variation. Later, change scale to $\frac{1}{2}$ in. equal 2 degrees; $\frac{1}{4}$ in. equal 2 degrees.

3. *Time.*

Hours, half-hours, quarter-hours; $\frac{1}{2}$, $\frac{1}{4}$, $\frac{3}{4}$, of 60 minutes. Count by fives to thirty; to sixty. Two times five minutes; three times five minutes; four times five minutes, etc. Multiples of five minutes plus one minute; plus two minutes; plus three minutes; plus four minutes.

4. *Observation Work.*

Count buds, leaves, petals, etc. Measure growth of twigs. Count legs of fly, spider, cray-fish. How many legs have two toads? two butterflies? two spiders? etc. How many toes on a cat's fore foot? Two fore feet? Hind foot? Two hind feet? How many in all? Soils—definite amounts measured by children; loam, sand, etc., separated, measured, and

compared. Boxes for measurement made by children. See III. Construction. Absorption of water by seeds.

III. CONSTRUCTION.

1. *Drawing lines, squares, oblongs, from dictation and to scale.*

Sheets for weather record, wind charts, thermometers, etc. Record sheets (score cards) for games.

2. *Related objects.*

Trays for paste. Boxes of various shapes and sizes for seeds, soil, pencils, crayon, and other collections and material; for measures—cubic inch, eight cubic inches. "Circle makers." (Cardboard)—1 in. by 6 in. divided into inches; ½ in. by 6 in. divided into ½ inches. Circles of colored paper for weather record. Clock dials, to be used in the study of time. Envelopes, book covers, etc.

In addition to the foregoing "Related Number Work" the author of the Werner Arithmetics suggests the following work in

MEASUREMENTS.

(*a*) *Pint, quart, and gallon.*

Measure water or sand. Speak of a pint as half a quart, and of a quart as a fourth of a gallon. Remove measures from sight and question pupils to determine whether they image them. Four pints (long pause here) are how many quarts? Four quarts (long pause here) are how many pints?

(*b*) *Foot ruler.*

Measure the desk, slate, blackboard, etc. Speak of inches as twelfths of a foot. Speak of three inches as one fourth of a foot; of nine inches as three fourths of a foot.

Speak of four inches as one third of a foot; of eight inches as two thirds of a foot.

(*c*) *Yard stick.*

Measure the blackboard, the room, a piece of rope, etc. Speak of one foot as one third of a yard; of two feet as two thirds of a yard. Speak of nine inches as one fourth of a yard; of eighteen inches as one half of a yard; of twenty-seven inches as three fourths of a yard.

PRIMARY FACTS OF MULTIPLICATION.

In teaching the primary facts of multiplication it is essential that the pupil should image magnitude—that is, that he should think some magnitude for the multiplicand, and for the product. He will be certain to do this if the questions are sometimes put in the following form:

How many feet have two boys? three boys? four boys?

How many sides have two triangles? three triangles? four triangles?

How many feet have two horses? three horses? four horses?

How many cents in two nickels? in three nickels? in four nickels?

How many legs have two flies? three flies? four flies?

How many days in two weeks? three weeks? four weeks?

How many legs have two spiders? three spiders? four spiders?

See that the pupil memorizes perfectly every number fact given on pages 6 and 7 of the Werner Arithmetic, Book I., before attempting the work on page 9.

BOOK I.

The following general directions apply to nearly every page of Book I., and to much of Book II. Exceptions may be made of those pages which contain nothing but review problems. Occasionally other pages may be attempted without the usual preparatory drill.

General Directions.

Do not allow the pupil to read a page until he has been thoroughly prepared for it. The pupil cannot prepare himself. *It is the business of the teacher* not simply to "hear recitations" but *to teach.* The teaching to be done in connection with this book is the leading of the pupil to perceive those magnitude relations and to memorize those primary number facts which are necessary to be perceived and memorized in order that the pupil may be able to read the pages. Until the teacher can devise a better plan for herself, she will do well to adhere strictly to the following order of procedure:

Step I.

The teacher takes the book. The pupils are without books and give their undivided attention to the teacher. The teacher reads a page, pausing at the blanks for the pupil to supply the necessary word or words. Pupils signify their readiness to answer by raising right hands. The teacher names the pupil who is to give the answer. (Occasionally, especially if the problems seem difficult, a pupil may come forward briskly and whisper his answer to the teacher. Another and another may follow rapidly until all who are prepared to do so have given answers. This promotes independence and enables the teacher better to judge of individual work.) If the teacher discovers that there are primary number facts introduced on the page, which have not been memorized by the pupil, this should be done at once. Do not proceed until this has been thoroughly accomplished. Better spend several days, if necessary, in the preparation for reading a single page, than to attempt to read it without proper preparation.

Step II.

See that the pupil is familiar with the written forms of all words appearing upon the page under consideration. Use the blackboard for this purpose and, as a rule, show all new words in the connection in which they appear in the book.

Step III.

Put the books into the hands of the pupils and let them read silently the page for which preparation has been made.

Step IV.

Pupils may now read aloud the page which has been read silently.

Step V.

The pupils may copy (filling the blanks) *some designated part* of the page. Allow no careless written work. In examining the papers make but two classes: those that are "perfect" and those that are "imperfect". The teacher is at fault if more than half the papers are "imperfect". In a well taught class often ninety per cent of the papers will be "perfect". In this examination of papers spelling, capital letters, punctuation, and figures are to be considered. If a single misspelled word or one figure or punctuation mark be wrong, the paper must be excluded from the "perfect paper" class. If the teacher finds it seemingly impossible to secure fifty to seventy-five per cent of "perfect papers", spend more time in preparation and diminish the amount of work required. Better a single statement accurately written than a half page with many errors. The work of the teacher should be *not mainly the correction but the prevention of errors.*

Page 9.—Observe that the work on this page contains problems in addition, subtraction, multiplication, division, and "partition".* It is not necessary for the pupil to know this fact, but the teacher should be familiar with the plan of the book in order to use it to the best advantage.

Page 10.—During the first reading of this page by the teacher (the pupils filling the blanks) each pupil should have a foot ruler in his hand. After this it may be read a second time, the ruler being hidden from view.

When reading statements 14 and 16 the pupils may "draw a square in the air", if such a procedure is necessary to assist their imaginative power. *They must be trained in every possible way to image magnitudes.*

Compare problems 7, 8, 9, 10, and 11, with the first five problems on the preceding page.

* The process sometimes called "partition" is merely *one aspect of division.* The term is a convenient one to designate that division process by which we find one of two or more equal parts of a number.

Page 11.—Note the similarity of each group of problems to the groups on page 9.

The problems at the bottom of this and other pages, present a step-by-step introduction to written work. Pupils should not only see that 28 and 2 are 30, but they should secure this result by the usual "carrying" process as well.

Page 12.—Use the foot ruler and the yard-stick as suggested for the work on page 10. Be sure that all new primary number facts are memorized; as, 2 12's are 24; 3 12's are 36, etc.

Do not omit the work suggested at the bottom of the page. The pupil must not only see that 30 less 2 equals 28, but he must obtain this result by the usual method of doing written work in subtraction.

Page 13.—Pupils must be taught to do such work as this *by imaging the figures* (*diagrams*) *named.*

In the last multiplication problem at the bottom of the page, the pupil should first see that 2 35's are 70; he should then be taught to obtain this result by the usual "carrying" process.

Page 14.—Before leaving this page the pupil should be able to complete the eighteen statements at the bottom of the page, reading them by line (not by column) in one minute or less.

Page 15.—It is essential that the pupil should become familiar with the *two aspects of division* presented on this page. 12 divided by 2, should suggest the finding of one half of 12, and the finding how many times 2 is contained in 12,—two problems that, so far as the pupil is concerned, are widely different.

Page 16.—During the first reading of this page by the teacher (the pupils filling the blanks) the pint and the quart measure may be before the pupils. The page should then be read again, the measures being hidden from view.

Observe that statements 10 to 19 present problems in addition, subtraction, multiplication, division, and "partition."

Page 17.—It is very important that the work on this page should be mastered; particularly that suggested by statements 8, 9, 10, 11, and the last part of 13, 15, and 16. The *teacher* should see in this work the foundation for working certain problems in percentage.

$\frac{2}{3}$ of 6 =	6 is $\frac{2}{3}$ of —.
$66\frac{2}{3}$ % of 6 =	6 is $66\frac{2}{3}$ % of —.

Pages 18–22.—One important purpose of these pages is to familiarize the pupil with the terms, *sum*, *difference*, *product*, and *quotient*. Such work is best accomplished by the *use* of these terms; *not by definition of them*.

Read the foot-notes carefully.

Page 23.—During the first reading of this page by the teacher (the pupils filling the blanks) diagrams similar to those at the top of the page should be on the blackboard in plain view of the pupils. During the second reading the diagrams may be hidden from view. The use of digits in this connection and at this stage of the work should be, in the main, avoided. It is especially essential that the pupil should learn to *think magnitude* when he makes these statements—*not mere symbols of magnitudes*.

Pages 24 and 25.—Note that some of the problems on these pages are similar to those on page 23, except that different magnitudes are employed. On page 23 the "half" is half of a *circle;* on page 24, it is half of an *inch;* on page 25, it is half of a *dollar*.

Page 26.—Do not leave this page until the pupil can easily find the half of many odd numbers, and the third of many numbers that are not exactly divisible by 3.

Pages 27 and 28.—Note the grouping of the problems on these pages. Read the foot-notes.

Pages 29–38.—These pages are mainly for review and drill. The foot-notes give the necessary directions to the teacher.

Page 39.—No more important exercise can be presented than that which leads the pupil to image magnitude. *Put great stress upon this phase of the work.* Arithmetic deals with measured magnitudes and their relations. The success of the pupil depends upon his ability to bring into consciousness the magnitudes to be compared.

Page 41.—These number facts must be perfectly mastered. The words "nine and four", or the figures $\frac{9}{4}$ must suggest 13, almost as quickly as do the figures 1 and 3 when placed side by side—13.

Read the foot-note.

Page 42.—On this page some of the number facts that have been learned are put into concrete problems. Note the step-by-step advancement in problems 7–10, 11–14, and 15–18.

Page 43.—The exercises at the top of the page are suggestive of valuable work that may be done with the blackboard and crayon. Teach pupils to estimate the length of lines and to compare one with another in the several ways here suggested.

Page 44.—Solve the problems at bottom of page first *without*, then *with* a pencil.

Page 45.—See directions for page 23. Use this page as there directed. Dispense with the blackboard diagrams as soon as possible; but if a pupil becomes confused take him to the diagrams again. Observe that upon this page are problems in addition, subtraction, multiplication, division, and "partition", of fractions. The pupil who has mastered the page should be able to read it (not by memorizing the words to fill the blanks, but by imaging the magnitudes and seeing their relation) in 2 minutes or less.

Page 46.—Observe that the number facts given on the preceding page are here given in concrete problems, and that there are two groups of problems, in each of which the usual variety (addition, subtraction, multiplication, division, and "partition") appears.

Pages 47 and 48.—During the first reading of these pages by the teacher (the pupils filling the blanks) the quart and the gallon measure should be in full view of the pupil. During the second reading they should be hidden from view. *Lose no opportunity to cultivate the imaginative faculty.*

Page 50.—The first nine problems on this page may be used as a test in the following manner: (1) Teacher reads one problem *very slowly*. (It may be necessary to read it several times. It is not so much a question of attention as it is of *imaging power.*) (2) Either have the answer written upon the slate or let each pupil whisper his answer to the teacher. In either case the teacher may say "right" or "wrong" as the case may be. If the answer is wrong do not explain, but encourage the pupil to make *another attempt to image the magnitudes and see their relation.* If after repeated trials it is found that he cannot do this, do not, even then, explain; give similar but less difficult problems. In this kind of problem the pupil must "learn to do by doing." There is no other way. Telling him how to "get the answer" is of no value whatever.

Do not omit or pass hastily over the problems at the bottom of the page. Require pupils to solve them *first without*, then *with* a pencil. If there is much hesitation review page 45.

Page 53.—Use the word *perimeter* and lead the pupils to use it before attempting the work on the page. Cause a two-inch square to be drawn upon the blackboard. Then say,—"The distance around a figure is its perimeter." Lead pupils to say,—"The perimeter of this figure is 8

inches." Have many figures drawn and the perimeter of each given by one or more pupils.

Page 55.—Follow directions given for work on pages 23 and 45. See foot-note on page 55.

Page 56.—Note that the problems on this page involve addition, subtraction, multiplication, division, and "partition", of fractions.

Pages 57 and 58.—Follow, substantially, directions given for work on pages 47 and 48.

Pages 59 and 60.—See directions for page 50.

Page 61.—Review pages 41 and 51. Treat this page in accordance with directions for page 41.

Page 63.—Review page 53. Pupils must learn to image each of these figures (diagrams) when its name is spoken. It is not necessary to commit to memory a definition of each.

Page 64.—Problems 4 and 5. Lead pupils to distinguish sharply and quickly between the kinds of problems here given. Ask, again and again, when such problems as these are presented, "*What does it mean?*"

Page 67.—The drill suggested on this page is invaluable. The other steps of this drill will be found on pages 77, 87, 97, 107, 117, 127, and 137. It is not expected that the pupil will become perfect in all these drills in a single year. The best plan is to drill for some time on columns of 2's and 1's as suggested on page 67. When pupils tire of this, pass to the drill suggested on page 77, occasionally reviewing page 67. Later, pass to page 87, *keeping up the reviews.* If at the close of the year the pupils are quite proficient in the work on four or five of these drill pages, the teacher may feel that she has done excellent work. This drill should be continued during the next school year. Often such exercises may be given with no figures in sight. Thus, the pupils may say, either singly or in concert, (*a*) 3, 6, 9, 12, 15, 18, 21, 24, 27, 30, etc.; (*b*) 1, 4, 7, 10, 13, 16, 19,

22, 25, 28, 31, etc.; (*c*) 2, 5, 8, 11, 14, 17, 20, 23, 26, 29, 32, etc. A few minutes each day should be spent in a recitation of this kind.

Page 70.—On this page tenths are presented for the first time without the written denominator. If the pupil clearly understands that .4 is another way of writing $\frac{4}{10}$, that 2.7 is another way of writing $2\frac{7}{10}$, etc., he will readily solve every problem on this page. This is the first step in "decimal fractions". Watch for the second step and review this before taking it.

Page 73.—Use the word *area*, and lead the pupils to use it before attempting the work on this page. Cause a two-inch square divided into one-inch squares to be drawn on the blackboard. Then say,—"The area of this square is how many square inches?" Cause a three-inch square to be drawn and divided in a similar manner. Then ask,—"How many square inches in the area of this square?" Do the same with a four-inch square, and with a five-inch square. With these figures upon the board lead pupils to make the following statements:

The perimeter of a two-inch square is 8 inches.
The area of a two-inch square is 4 square inches.
The perimeter of a three-inch square is 12 inches.
The area of a three-inch square is 9 square inches.

etc., etc., etc.

Page 74.—Problems 3 and 4. Review problems 4 and 5, page 64.

15 apples ÷ 3 apples, means what?
15 apples ÷ 3, means what?

Do not omit the work with pencil suggested at bottom of page. Require absolute accuracy in this work.

Page 79.—Read the foot-note.

Page 82.—Be sure that the number facts given on this page are perfectly memorized.

Page 83.—Lead the pupil to image every diagram described.

Give other problems similar to 12 and 13, 14 and 15, 16 and 17, 18 and 19, if the distinction does not seem clear to pupils.

Page 88.—In solving, with a pencil, the twenty problems at the bottom of this page, insist upon *absolute accuracy.* Unless 75 % of the class can solve the 20 problems at one sitting, having not a single error in the work, the problems at the bottom of pages 44, 48, 50, 54, 58, 60, 64, 68, 70, 74, 78, 80, 84, must be reviewed, the work being done with pencils, and the teacher putting *increased emphasis upon the matter of accuracy.*

Page 89.—Note the grouping of problems on this page.

First do the work orally in the following order: (1) Teacher puts a problem (as 12 qts. plus 3 qts.) on the blackboard. (2) Pupil tells the meaning (12 qts. plus 3 qts., means, 12 qts. *and* 3 qts.). (3) Pupils give the answer (12 qts. and 3 qts. are 15 qts.).

In presenting problems like those on this page (particularly one like No. 8, 9, or 10; 13, 14, or 15, etc.) ask the question again and again,—"What does it mean?"

Page 90.—Review pages 70 and 80. Note the step-by-step process at bottom of page: 12 in. ÷ 2 in.; 12 tenths ÷ 2 tenths; 1.2 (to be read 12 tenths) ÷ 2. One-half of 12 in.; one-half of 12 tenths; one-half of 1.2 (to be read 12 tenths).

Page 92.—Problem 11. See page 49, problem 16; and page 59, problem 15.

Page 94.—Problem 1. Review problems similar to this, on pages 44, 54, 64, 74, and 84.

Page 96.—Unless the problems on page 89 have been mastered, do not attempt this work. Often ask, "What does it mean?"

2 and $\frac{1}{3}$ pies divided by $\frac{1}{3}$ of a pie, means, *find how many times one-third of a pie is contained in two and one-third pies.* One-third of a pie is contained in two and one-third pies seven times.

4 and $\frac{1}{3}$ pies divided by 2 means, *find one-half of* $4\frac{1}{3}$ *pies;* one-half of $4\frac{1}{3}$ pies is $2\frac{1}{6}$ pies.

Pupils will solve such problems as these easily, provided they know what they mean and *image magnitude.*

Page 99.—Proceed slowly and carefully here. Review pages 89 and 96. Note the grouping of problems. Compare the grouping with that on the first page of problems—page 9. Note the pages that should contribute to the power necessary to the solving of these problems. If a pupil is weak, find exactly what he has omitted to do, that accounts for his weakness. Then lead him along the lines that will give him the necessary knowledge and strength.

Page 114.—If the pupil understands that *to multiply by one-half means to take one-half of the multiplicand,* he will have no serious difficulty with the work on this page.

Page 119.—Observe that each group on this page contains *six* instead of *five* problems as heretofore. The new one is the fourth in each group. Page 114 should prepare the pupil for this addition to the group. 12 min. multiplied by $2\frac{1}{2}$ means, 2 times 12 min. and $\frac{1}{2}$ of 12 min.

Page 125.—The work on this page should be preceded by such questions as the following:

1. To what can halves be changed? Ans. 4ths, 6ths, 8ths, etc.

2. To what can thirds be changed? Ans. 6ths, 9ths, 12ths, etc.

3. To what can fourths be changed? Ans. 8ths, 12ths, 16ths, etc.

4. To what can fifths be changed? Ans. 10ths, 15ths, etc.

5. To what can sixths be changed? Ans. 12ths, 18ths, etc.

6. To what can halves and thirds be changed? Ans. 6ths, 12ths, etc.

7. To what can thirds and fourths be changed? Ans. 12ths, 24ths, etc.

After such an oral drill the work of the page may be attempted in the usual manner.

Page 129.—See that the meaning of the fourth problem in each group is clearly understood. Problem 11: This means find how many times 6 tenth-dollars are contained in 36 tenth-dollars.

Page 135.—To what may halves and fifths be changed?

Page 145.—To what may fourths and sixths be changed?

Page 150.—Before attempting this page, present orally such problems as the following: $2 \div \frac{1}{2}$: This means find how many times $\frac{1}{2}$ is contained in 2; one-half is contained in 2 four times.

$\frac{3}{4} \div \frac{1}{8}$: This means find how many times $\frac{1}{8}$ is contained in $\frac{3}{4}$; $\frac{1}{8}$ is contained in $\frac{3}{4}$ six times.

$\frac{3}{8} \div \frac{2}{8}$: This means, etc. $\frac{7}{8} \div \frac{3}{8}$: This means, etc.

To what may thirds and fourths be changed?

After such an oral drill the work of the page may be attempted.

Page 155.—Note the order in which the problems are given. Compare with pages 9, 11, 27, 96, 99, etc.

Pages 156 and 157.—Note the step-by-step process. The pupil first learns to add, subtract, multiply, divide, and "part," a number of tenth-dollars (think of $1.2 as 12

tenth-dollars). He then learns to perform similar operations with numbers of tenths used abstractly.

See that the pupil knows the meaning of each problem and images magnitude whenever it is suggested by the digits employed.

Pages 158, 159, 160, and 161.—Compare these pages with pages 18, 19, 20, and 21.

If, in the work in decimals, the pupils think the magnitudes with which they are dealing, they will find no serious difficulty in "pointing off" correctly. While solving the division problems on page 161, observe that when the dividend and divisor are concrete, the pupil must *find how many times the divisor is contained in the dividend;* that when the dividend is concrete and the divisor abstract, the pupil must *find some part of the dividend.*

Pages 163, 164, and 165.—Observe that pages 163 and 164 provide the necessary preparation for learning to multiply by a number of tenths. Such work is given on page 165. Impress upon the pupil that to multiply by one half is *to take one half of the multiplicand;* that to multiply by four tenths is to *take four tenths of the multiplicand;* or, multiplying by four tenths is *taking four times one tenth of the multiplicand.*

Page 166.—In written work in decimals, do not allow the pupil to "forget what he is doing in learning how to do it." While multiplying $275 by 2.3, he must not, for a moment, lose sight of the fact that he is to find two times $275, to which is to be added 3 tenths of $275. He must see clearly that he multiplies 1 tenth of $275 ($27.5) by 3 in order to find 3 tenths of $275.

Pages 168-174.—The only caution necessary to a thoughtful teacher leading a class of pupils over these pages is, *proceed slowly and be sure that the pupil knows the meaning of every problem before he attempts to solve it.*

Page 175.—Observe the new group of problems, 11-18.

GROUP OF PROBLEMS.

One in addition of fractions.
One in subtraction of fractions.

Three in multiplication { fraction by an integer. / integer by a fraction. / integer by a mixed number.

Three in division { fraction by a fraction. / integer by a fraction. / fraction by an integer.

Difficulties for the most part vanish when the pupil knows the meaning of each problem.

Page 177.—Note the step-by-step process again.

1. Inches divided by inches.
2. Tenths divided by tenths.
3. Fourteenths divided by fourteenths.

etc., etc.

Page 178.—This page is to lead the pupil to see (1) that 20 times a number is 2 times 10 times a number; and (2) that 23 times a number is 20 times a number plus 3 times the number; that 25 times a number is 20 times the number plus 5 times the number, etc.

Page 179.—Use the word *reduce* and lead the pupils to use it before attempting the page.

Page 180.—By oral work, lead pupils to distinguish between *a square inch* and *a 1-inch square.* A square inch is a 1-inch square *or its equivalent.*

Page 185.—Compare the grouping of problems, 11-18, with the group on page 175.

Page 187.—The new problem in group 1-9, is the sixth. $\$\frac{1}{2}$ multiplied by $\frac{1}{8}$, means find $\frac{1}{8}$ of $\$\frac{1}{2}$.

Pages 195-214.—Observe that these pages are identical in plan with pages 155-174. Compare page 155 with 195; 156

with 196 ; 157 with 197, etc. If pupils have trouble with any of these pages (195-214) review the corresponding pages (155-174).

Page 219.—This work cannot be properly done without means for finding the weights of many different objects.

Pages 220 and 221, 230 and 231, 240, and 241.—While solving the problems on these pages the pupil should be constantly exercised in bringing the images of measured magnitudes into consciousness. The word *cube*, *square*, *oblong*, or *rectangle* must instantly call into the consciousness of the pupil an image of that for which the word stands. He must see each figure too, *in its true proportions. It is absurd and positively harmful to ask the child to see relations when he has not in mind the things related.*

Pages 222 and 223, 232 and 233, 242, and 243.—If the problems on these pages give trouble, review pages 182 and 183, 192 and 193.

Pages 224, 234, 238, 244, 245, and 250.—Insist on *absolute accuracy* in solving the problems on these pages. The work is mainly mechanical and must be mastered.

Pages 227, 229, 230, 239, 240, 241, 246, 247, 248, and 249.—Upon these pages each problem for the slate is designated by *a letter* and is preceded by a more simple problem similar in form designated by *a figure*. The solution of each *figure problem* should give the necessary preparation for the *letter problem* that follows it. Pupils should be encouraged after reciting the *figure problems* to solve the *letter problems* at their seats and without further assistance.

By the foregoing plan, indeed by the plan of the entire book, the "mental arithmetic" is made to relate itself closely and effectively to the "written arithmetic".

BOOK II.

Pages 5-9.—If pupils have completed Book I. little attention need be given to these pages; otherwise, the teacher should examine carefully pages 89, 99, 109, 114, 119, 125, 129, 145, and 155, of Book I., and then *present orally* to the class the work on page 5 of Book II. With the aid of the "number stories" and frequent references to Book I. that follow, no serious difficulty will be experienced. When the work on pages 5, 6, and 7 has been mastered, proceed in a similar manner with the problems on pages 8 and 9. Before beginning the work of these pages the teacher should read carefully pages 155–175 and 195–215 of Book I.

General Directions.

Read with great care the "Suggestions to Teachers" on *page 10*. Take every "step" in the order given. Do not allow pupils to attempt the *letter problems* upon a given page until the *figure problems* on the same page have been mastered.

Frequently review the *figure problems*. Especially do this when the advance work seems too difficult. For instance, if trouble is anticipated with the problems on page 96 review the *figure problems* on pages 46, 56, 66, 76, and 86.

The decimal arrangement of Book II. will enable the teacher and pupil to turn readily to the pages which are directly preparatory for any given page; thus, 15, 25, and 35 prepare for 45; 17 and 27 prepare for 37, etc.

This is preëminently a *drill-book* and it is a *step-by-step book*. Serious difficulty anywhere in the book indicates that some *step* has been omitted. It is the work of the teacher in such cases to find the omitted step, lead the pupil to it, and allow him to take it. It is only by *step-taking* that he can be prepared for each successive step.

Little "explaining" by the teacher is necessary in learning to walk, to ride a bicycle, or to solve problems in arithmetic. *Skill in each process is acquired by doing for one's self. Do* to-day and thereby acquire power to do more to-morrow. The pupil must *do;* the teacher *directs and encourages.*

The *letter problems* are for seat-work. It is recommended that the teacher keep this Hand-Book within easy reach, and when the class is called, test the seat-work of the pupils by the answers here given. By such procedure the written work can be quickly disposed of and time saved for *teaching.*

Give little commendation to pupils who make one or more errors in written work. Inaccurate results are valueless. Careless "third-graders" make careless "fourth-graders;" careless "fourth-graders" make careless "eighth-graders;" and careless "eighth-graders" make careless men and women. Give much higher commendation to those who do a small amount of work accurately than to those who do a large amount carelessly.

ANSWERS TO "LETTER PROBLEMS."

Page 11.

a 3535
b 64
c 72

Page 12.

a $\frac{21}{28}$, $\frac{8}{28}$
b $\frac{21}{35}$, $\frac{25}{35}$
c $\frac{15}{40}$, $\frac{16}{40}$
d $815\frac{23}{24}$
e $204\frac{8}{21}$
f 95 t's
g $185\frac{20}{21}$
h $193\frac{7}{24}$
i 11 t's

Page 13.

a 66.866
b 5.152
c 104.032
d 75 t's
e 5.007 acres.
f 71.578
g 46.424
h 35.27
i 77 t's
j $.077

Page 15.

a 64 cu. in.
b 125 cu. in.
c 216 cu. in.
d 343 cu. in.
e 1728 cu. in.

Page 16.

a $260

Page 18.

a 362
b $362\frac{1}{2}$
c 224
d $224\frac{1}{4}$
e 242
f $242\frac{1}{3}$
g 175
h $175\frac{2}{3}$
i 752
j 753
k 2096
l 2098
m 1956
n $1957\frac{1}{2}$
o 2390
p $2392\frac{1}{2}$

Page 19.

a 136.08
b $95.13
c 207 sq. in.
d 126
e 138

Page 20.

a 32
b 232
c $318\frac{1}{4}$ acres.
d 80 lb.
e $19.32
f $12\frac{5}{8}$ yd.
g $24.80
h $3.25

Page 21.

a $43
b $4.30
c $45
d $5.70
e $42
f $3.20
g $63
h $6.20
i $52
j $5.30

Page 22.

a $\frac{18}{45}$, $\frac{10}{45}$
b $\frac{21}{36}$, $\frac{20}{36}$
c $\frac{27}{45}$, $\frac{35}{45}$
d $716\frac{4}{45}$
e $553\frac{19}{36}$

f 72 t's*
g $43\frac{1}{4}$ mi.
h 44 t's
i $55\frac{1}{6}$ mi.

Page 23.

b 103.8
c 7.05
d 8.19
e 17 t's
f \$ .17

Page 24.

a 400 lb.
b 500 lb.
c 1500 lb.
d 20 lb.
e 480 lb.
f 250 lb.
g 250
h $15\frac{5}{8}$ bu.
i 50 bu.
j $57\frac{1}{7}$ bu.
k 24 t's
l $24\frac{1}{3\frac{1}{2}}$ t's
m $24\frac{1}{1\frac{1}{6}}$ t's
n $24\frac{1}{8}$

Page 25.

a $2\frac{10}{7}$ cu. yd.
b $4\frac{1}{2\frac{1}{7}}$ cu. yd.
c 8 cu. yd.
d 343 cu. ft.
e 512 cu. ft.
f 729 cu. ft.
g 1000 cu. ft.
h 1331 cu. ft.
i 1728 cu. ft.

Page 26.

a 72
b 128
c 64
d 144
e 48
f 192
g 88
h 336
i 108
j $85\frac{1}{3}$
k \$672
l 484 bu.

Page 27.

a \$124
b \$142

Page 28.

a 57
b $57\frac{1}{8}$
c 122
d $122\frac{1}{4}$
e 142
f $142\frac{2}{7}$
g 1968
h 1972
i 2457
j $2493\frac{3}{4}$
k 1434
l 1448
m \$10.26
n \$13.68
o \$17.10
p \$20.52
q \$16.08
r \$21.44

Page 29.

a 175 t's
b 6.007
c 1820 lb.
d 225 sq. ft.
e 25 sq. yd.
f 3375 cu. ft.

* Problem f, page 22 ($48 \div \frac{2}{3}$), may mean, find how many times $\frac{2}{3}$ is contained in 48, in which case the answer is, as given above, "72 times"; or it may mean, find $\frac{2}{3}$ of 48, in which case the answer is simply 72. The latter view is presented in the problem $\$48 \div \frac{2}{3}$, but it is not thought advisable to confront the pupil with the double aspect of such problems at this stage of the work. The second aspect is fully considered on page 162 (Book II.), and on the pages that follow page 162.

g 125 cu. yd.
h 99
i 176
j 176

Page 30.

a \$.50
b $4\frac{1}{2}$ tons.
c \$9.10
d 558 in.
e 364 da.
f 300 qt.
g 568 pt.
h \$234
i \$564.75

Page 31.

a 382
b 2293
c $3526\frac{4}{5}$
d 19617
e 143 t's
f \$143
g $5635\frac{4}{5}$
h 30033
i 46 t's
j 46 bu.

Page 32.

a 35
b $86\frac{1}{2}$
c 89
d $\frac{5}{8}$
e $\frac{1}{5}$
f $\frac{3}{10}$
g $\frac{12}{24}$, $\frac{16}{24}$, $\frac{9}{24}$
h $\frac{6}{12}$, $\frac{8}{12}$, $\frac{9}{12}$
i $\frac{21}{24}$, $\frac{8}{24}$, $\frac{16}{24}$
j $209\frac{7}{24}$
k $558\frac{7}{24}$
l 48 t's
m 56 t's
n $69\frac{1}{8}$ gal.

Page 33.

a \$5.635
b \$8.76
c \$168.96
d \$15.48
e \$7.74
f 92.77
g 53.58
h 9.75
i 95 t's
j \$9.50

Page 34.

a 2.435 tons.
b 2.49 tons.
c 2.63 tons.
d 2.875 tons.
e 3.24 tons.
f 3.63 tons.
g 7040 lb.
h 8740 lb.
i 10360 lb.
j 7440 lb.
k 2960 lb.
l 4648 lb.
m 7400 lb.
n 9800 lb.
o \$34.50

Page 35.

a 138 sq. ft.; 58 ft.
b 175 sq. in.; 64 in.
c 120 sq. yd.; 46 yd.
d 736 sq. ft.; 110 ft.
e 600 sq. in.; 100 in.
f 504 sq. yd.; 90 yd.

Page 36.

a $91\frac{2}{3}$
b 825
c $188\frac{1}{2}$
d 754
e 36
f 225
g 54
h 150
i 72
j 81
k \$$109\frac{1}{2}$
l \$51.30
m \$18.40

Page 37.

a 1900 bu.

Page 38.

a 116
b $116\frac{1}{3}$
c 87
d $87\frac{2}{5}$
e 3339
f 3342
g 890
h 892
i \$21.96

j $29.28
k $36.60
l $43.92
m $22.40
n $22.82

Page 39.

a $64\frac{4}{8}$
b 37
c 64
d $55\frac{6}{7}$
e $\frac{13}{25}$
f $\frac{13}{40}$
g $\frac{13}{17}$
h $\frac{3}{5}$
i $\frac{18}{30}$, $\frac{25}{30}$, $\frac{16}{30}$
j $\frac{20}{30}$, $\frac{18}{30}$, $\frac{15}{30}$
k $\frac{15}{40}$, $\frac{16}{40}$, $\frac{20}{40}$
l $14.40
m 2.875 tons.
n 3.66 tons.
o 1.575 tons.
p 324 sq. ft.; 78 ft.
q 225 sq. in.; 60 in.
r $18.90

Page 40.

a 224 girls.
b $875
c 156 posts.
d 3359
e $258
f 112 sq. in.
g 56 ft. 2 in.
h 139 wk. 2 da.
i 54 lb. 10 oz.

Page 41.

a 2, 2, 2, 5
b 2, 2, 3, 5
c 5, 13
d 2, 2, 2, 3, 3
e 2, 43
f 5, 17
g 20272
h $23\frac{3}{8}$ t's
i $139\frac{1}{8}$ lb.
j 19458
k $26\frac{1}{16}$ t's
l $116\frac{2}{3}$ lb.
m 15925
n 29 t's
o 126 lb.
p 25002
q $24\frac{7}{8}$ t's
r 149 lb.

Page 42.

a $\frac{55}{2}$
b $\frac{196}{4}$
c $\frac{378}{5}$
d 57
e $74\frac{6}{7}$
f $64\frac{1}{2}$
g $\frac{14}{28}$, $\frac{21}{28}$, $\frac{20}{28}$
h $\frac{20}{24}$, $\frac{16}{24}$, $\frac{9}{24}$
i $\frac{12}{20}$, $\frac{15}{20}$, $\frac{10}{20}$
j $269\frac{13}{20}$
k $624\frac{3}{28}$
l $3\frac{1}{6}$
m $2\frac{2}{3}$
n $2\frac{2}{5}$
o 54 t's
p $125\frac{1}{10}$ acres.

Page 43.

b $10.41
c $21.48
d $.738
e $1.576
f $35
g 471.1
h 68.2
i 17.80
j 144 t's
k $1.44

Page 44.

b $12.96
c $11.76
d $16.585
e $16.80
f $15.96
g $15.66
h 444 ft.
i 540 in.
j 1440 min.
k 86400 sec.
l 420 mo.
m 364 da.
n 592 oz.
o 196 qt.
p 1376 qt.
q 896 pt.

r 3600 sq. in.
s 315 sq. ft.

Page 46.

a $96\frac{2}{4}$
b 1548
c $144\frac{4}{6}$
d 3620
e 350
f 504
g 736
h 1150
i 610
j 213
k $1120
l $57
m $23.40

Page 48.

a 597
b 548
c $11.25
d $363.75
e $32.55
f $29.16
g $12.66
h $37.66
i 604
j 843
k $1600
l $1552
m $1400
n $2200

Page 49.

a 2, 2, 5, 5
b 5, 5, 5
c 126
d $\frac{2}{4}\frac{5}{8}$, $\frac{1}{8}$
e $1\frac{7}{3}\frac{3}{3}$, $\frac{2}{4}\frac{9}{4}\frac{1}{1}$
f $46\frac{2}{7}$, $77\frac{4}{7}$
g $\frac{2}{3}\frac{1}{6}$, $\frac{2}{3}\frac{0}{6}$
h $37.59
i $14.84
j 441 cu. in.
k $462

Page 50.

a 405 yr.
b $13875
c 1440 lb.
d Tues. 6:20 p. m.
e $11\frac{5}{8}$ lb.
f $38.50
g $140.25

Page 51.

a 5, 2, 2, 7
b 2, 2, 2, 2, 2, 5
c 5, 3, 3, 3
d 5, 5, 7
e 5, 5, 5, 2
f 5, 5, 3, 3
g 33655
h $16\frac{6}{7}$ t's
i 128 lb.
j 39312
k $15\frac{3}{5}\frac{3}{5}$ t's
l $120\frac{5}{1}\frac{5}{2}$ lb.
m 43368
n $13\frac{1}{5}\frac{1}{6}$ t's
o $114\frac{1}{2}$ lb.
p 48297
q $15\frac{3}{5}\frac{3}{6}$ t's
r $137\frac{3}{4}$ lb.
s 45980
t $17\frac{1}{5}\frac{3}{6}$ t's
u $144\frac{5}{6}$ lb.

Page 52.

a $1\frac{1}{1}\frac{3}{8}$
b $1\frac{7}{1}\frac{7}{2}$
c $1\frac{5}{2}\frac{5}{4}$
d $\frac{3}{3}\frac{1}{6}$
e $\frac{7}{1}\frac{7}{2}$
f $\frac{1}{2}\frac{7}{4}$
g $\frac{5}{2}\frac{5}{4}$
h $\frac{1}{3}\frac{1}{6}$
i $2\frac{5}{8}$ t's
j $5\frac{1}{3}$ t's
k $3\frac{3}{4}$ t's
l $3\frac{4}{7}$ t's
m 132
n 945
o 385
p 72
q 56
r 57
s 60 t's
t $126

Page 53.

b $74.75
c $154.24
d $119.54
e $128.16

f $37.52
g $245.7
h $647.4
i $191.70
j $257.04
k 16.074
l 43.3
m 243
n 120 t's
o $1.20

Page 54.

a 320 rd.=1 mi.
b 1600 rd.
c 660 ft.
d 154 yd.
e 2240 rd.
f $23.40
g $7.02

Page 55.

a 128 cu. ft.
b 256 cu. ft.
c 192 cu. ft.
d 96 cu. ft.
e 672 cu. ft.
f 864 cu. ft.
g 288 sq. ft.
h 384 cu. ft.

Page 56.

a 8.21
b 295.56
c $1.33
d $65.17
e 500
f 1533
g 396
h 2163
i 312
j 93
k $512
l $28

Page 58.

a 230
b 219
c 507
d 394
e $7.62
f $17.78
g $44.45, $590.55
h 865
i 575
j 712
k 801
l $1200
m $1200
n $900, $837
o 3%

Page 59.

a 5, 43
b 5, 2, 47
c 690
d $1\frac{3}{16}$
e $10\frac{2}{3}$
f $81
g $437\frac{1}{4}$ ft.
h 2360 rd.
i 1520 rd.
j 231 yd.
k 352 yd.
l $30
m 256 cu. ft.
n $15

Page 60.

a 184 rd.
b $5.52
c 9 hr. 14 min.
d $2.70
e 168 hr.
f 744 hr.
g $3.15
h 23 copies.
i 11 copies.
j 5146.165
k 4499.55

Page 61.

b 16920
c 18720
d 36750
e 38520
f 17200
g 28200
h 30000
i 33600
j 5, 2, 29
k 5, 2, 43
l 24290
m 122 t's
n 74 lb.
o 40250

p $135\frac{2}{7}$ t's
q $67\frac{1}{2}$ lb.

Page 62.

a $631\frac{3}{10}$
b $2184\frac{2}{5}$
c 36 t's
d 42 t's
e 27 t's
f $29\frac{1}{12}$ ft.
g $1\frac{1}{12}$ ft.
h $248\frac{7}{12}$ ft.*
i 264
j 93
k $387\frac{3}{5}$
l $\$13\frac{1}{4}$
m $\$13\frac{3}{4}$
n $\$216\frac{1}{4}$

Page 63.

b $1031.32
c $1976.25
d $2185.92
e $2078.88
f $2057.55
g $65.52
h $5.16
i .961
j 7.788
k 3.526
l 62 t's
m $6.2

Page 64.

a $11.55
b $23.375
c $13.78
d $12.015
e 2560 rd.
f 495 ft.
g 198 yd.
h $67\frac{1}{2}$ bu.
i 2.62 tons.
j 3288 in.

Page 65.

a 1008 sq. rd.
b 468 sq. ft.
c 2760 cu. ft.
d $34\frac{1}{2}$ cd.

Page 66.

a 44.2
b 2828.8
c 337
d 8425
e 425
f 1088
g 261
h 725
i 297
j 495
k $925
l $2.43
m $10.40

Page 68.

a 348
b 410
c 174
d 369
e $30.45
f $44.28
g $75.06, $758.94
h 350
i 336
j 460
k 368
l 3200
m 5900
n $600, $546

Page 69.

a 6240
b 67200
c 144
d 144
e $811.2
f $821.34
g $1256.25
h $5.48+
i $14.88+
j 282 sq. rd.
k 210 cu. ft.

Page 70.

a $2916

*3)745¾. Solve as follows: One-third of 7 is 2, with 1 remainder; one-third of 14 is 4, with 2 remainder; one-third of 25 is 8, with 1 remainder; $1\frac{3}{4}=\frac{7}{4}$; one-third of $\frac{7}{4}$ is $\frac{7}{12}$.

b $11.25
c $51.00
d 95 lb.
e 270.84
f 1152 cu. in.
g $7.00

Page 71.

b 24.7
c 13.7
d 14.7
e 16
f 3.24
g 2.43
h 1.79
i 1.22
j 2, 2, 31
k 2, 89
l 12 t's
m 132 cu. ft.
n 15 t's
o 163 sq. rd.

Page 72.

a $1607\frac{7}{10}$
b $2946\frac{3}{10}$
c $4084\frac{7}{8}$
d $152\frac{11}{13}$
e $555\frac{3}{4}$
f $2037\frac{3}{4}$
g $1648\frac{1}{8}$
h $129\frac{1}{3}$
i $22\frac{2}{5}$
j $21\frac{3}{13}$
k $\frac{39}{40}$
l $177\frac{7}{13}$
m $622\frac{7}{10}$
n $252\frac{13}{30}$
o 4162
p $71\frac{6}{13}$
q $121\frac{11}{13}$

Page 73.

b $25.431
c $23.318
d $14.175

Page 74.

a 5280 ft.
b 2640 ft.
c 1920 rd.
d 495 ft.
e 10560 ft.
f $412\frac{1}{2}$ yd.
g 13200 ft.
h 800 rd.
i $21.655
j $4.14
k $9.30
l $13.95
m $12.30
n $10.15
o $36\frac{1}{2}$ ft.
p $48\frac{1}{3}$ ft.
q $284\frac{1}{3}$ yd.
r $241\frac{2}{3}$ yd.
s 38 rd.
t 36 rd.
u 138 rd.
v 116 rd.

Page 75.

a 4 acres.
b 8 acres.
c 16 acres.
d $3\frac{1}{4}$ acres.
e $3\frac{1}{2}$ acres.
f $3\frac{3}{4}$ acres.
g $4\frac{1}{2}$ acres.
h $7\frac{1}{2}$ acres.
i $11\frac{1}{4}$ acres.
j 18 acres.
k 384 cu. ft.
l 3 cd.
m $1\frac{1}{2}$ cd.
n 3 cd.
o $2\frac{1}{4}$ cd.
p $4\frac{1}{2}$ cd
q $18

Page 76.

a 19.6
b 313.6
c 19.5
d 487.5
e 21.6
f 38.4
g 24.8
h 55.8
i 71.6
j 49.2
k $100.60
l $7.20

Page 78.

a 72
b 120

c 168
d 144
e $9.60
f $13.44
g $70 ; $805
h 440
i 264
j 184
k 224
l 4500
m 2400
n { $435 / $400.20

Page 79.

a 20.9
b 1.89
c 1.9
d .493
e 6.1
f 8.2
g 1587
h 1587
i .7155
j 27720 ft.
k 2800 rd.
l $6\frac{3}{4}$ acres.
m 54 cd.
n 2304 cu. ft.
o 18 t's
p 2400 sq. rd.
q 15 t's
r 3840 rd.
s 12 t's
t 16450 lb.
u 8.225 t's

Page 80.

a $31\frac{1}{4}$ bags.
b 78 yr.
c ——
d $3.10
e $2.51
f $25.30
g 2144

Page 81.

a $\$25\frac{1}{2}$
b 85
c 92
d 1510 lb.
e 5, 3, 13
f 5, 37
g 43200
h 153
i 612500
j 12.5
k 294400
l 23.46
m 300240
n 21

Page 82.

a $1294\frac{3}{4}\frac{7}{8}$
b $5431\frac{1}{4}\frac{1}{8}$
c $2858\frac{1}{2}$
d $143\frac{7}{2}\frac{7}{0}$
e $257\frac{1}{5}$
f $2829\frac{1}{5}$
g $1451\frac{1}{1}\frac{1}{0}$
h $143\frac{1}{3}$
i $20\frac{5}{8}$
j 24
k $\frac{44}{45}$
l $113\frac{5}{1}\frac{5}{2}$
m $585\frac{2}{4}\frac{5}{8}$
n $327\frac{2}{4}\frac{3}{8}$
o 5978
p $67\frac{1}{1}\frac{1}{1}$ t's
q $82\frac{2}{1}\frac{2}{5}$ in.

Page 83.*

a 187 t's
b 1748 t's
c 384 t's
d 186 t's
e 23 t's
f 274 t's
g 304 t's
h $12.45
i $15.02
j 32 t's
k $32
l 609 t's
m $6.09
n 67 t's
o $6.7
p 185 t's
q $1.85

*See footnote, page 21.

Page 84.

a 1120 ft.
b 1400 ft.
c 112 ft.
d 168 ft.
e 15840 ft.
f 960 rd.
g 480 sq. rd.
h 384 cu. ft.
i 18480 ft.
j 1120 rd.
k 560 sq. rd.
l 448 cu. ft.
m $57\frac{3}{4}$ ft.
n 126 in.

Page 85.

a 1080 cu. ft.
b 40 cu. yd.
c 180 sq. ft.
d 20 sq. yd.
e 216 cu. ft.
f 216 sq. ft.
g $5\frac{3}{4}$ acres.
h $7\frac{1}{2}$ cords.
i $12\frac{1}{4}$ acres.
j $18\frac{1}{4}$ acres.
k $6\frac{1}{2}$ acres.
l $15\frac{3}{4}$ acres.
m 6 cords.
n 8 cords.
o 4 cords.
p 10 cords.

Page 86.

a 2.465
b 39.12
c 1.648
d 41.2
e 5.25
f 13.44
g 5.67
h 15.75
i 14.04
j 5.85
k $30.70
l $2.60

Page 88.

a 82.5
b 253.4
c 392.4
d 142.5
e 16.08
f 57.68
g \$95.40, \$858.60
h 1241
i 803
j 324
k 2508
l 9300
m 7700
n \$762, \$685.80

Page 89.

a 37
b 259 t's
c 259 t's
d $3.20
e 486 cu. ft.
f 432 sq. ft.
g ——
h ——
i 810 cu. ft.
j 30 cu. yd.
k 1575
l 1656
m 1461
n 1835

Page 90.

a 340 mi.
b 74 acres.
c $25
d $30
e $42
f 16
g $218.70
h $108.45

Page 91.

a 1693 lb.
b 1064 lb.
c 2523 lb.
d 627 lb.
e 1442 lb.
f 2760 lb.
g 904 lb.
h 1615 lb.
i 1179 lb.
j 3047 lb.
k 2350 lb.
l 2413 lb.
m 2403 lb.
n 2406 lb.

o 2456 lb.
p 2363 lb.
q 2463 lb.
r 16854 lb.
s 16854 lb.
t $2407\frac{5}{7}$ lb.
u 2, 5, 5, 5, 11
v 2, 2, 2, 5, 7
w 48 t's
x 48 cu. ft.

Page 92.

a $1340\frac{14}{15}$
b $561\frac{7}{30}$
c $1883\frac{11}{15}$
d $241\frac{7}{15}$
e $432\frac{3}{5}$
f $5479\frac{3}{5}$
g $1874\frac{1}{6}$
h $117\frac{1}{2}$
i $47\frac{1}{3}$
j $21\frac{5}{14}$
k $2\frac{11}{18}$
l $124\frac{1}{3}$*
m $662\frac{19}{30}$
n $253\frac{13}{15}$
o 18090
p 160 t's
q $127\frac{1}{3}$ yd.

Page 93.

a 452
b 1840
c 650
d 340
e 36
f 430
g 625
h $12.30
i $36.40
j 132 t's
k $132
l 489 t's
m $4.89
n 79 t's
o $7.9
p $7.95
q $609.5
r $7.95
s $60.95
t $1120.95
u 532 doz.
v $2563.20

Page 94.

a $4.80
b $4.95
c 6 t's
d 9 t's

Page 95.

a 96 rd.
b 560 sq. rd.
c $3\frac{1}{2}$ acres.
d $140
e 132 rd.
f 1080 sq. rd.
g $6\frac{3}{4}$ acres.
h $405
i $66
j 72 sq. yd.
k 70 sq. yd.
l $74\frac{2}{3}$ sq. yd.
m $93\frac{1}{3}$ cu. yd.
n 96 cu. yd.

Page 96.

a 17.5
b 19.75
c 16.6
d 8.25
e $\frac{6}{7}$
f $\frac{7}{6}$
g $\frac{35}{37}$
h $\frac{37}{35}$
i $\frac{16}{16}$
j $\frac{16}{15}$
k $\frac{2}{4}$
l $\frac{4}{3}$
m $\frac{1}{6}$
n $\frac{1}{8}$
o $\frac{2}{3}$
p $\frac{25}{36}$

* $5)\overline{621\frac{2}{3}}$. Solve as follows: One fifth of 6 is 1, with 1 remainder; one fifth of 12 is 2, with 2 remainder; one fifth of 21 is 4, with 1 remainder; $1\frac{2}{3} = \frac{5}{3}$; one fifth of $\frac{5}{3} = \frac{1}{3}$.

Page 97.

a $30.45
b $74.88
c $3.072
d $3.378
e $416.20
f 5200
g 12700
h 7300
i 7300
j 7600
k 7200
l 27%
m $22\frac{1}{2}$%
n 28%
o $28\frac{1}{3}$%
p 24%
q $24\frac{1}{2}$%
r 19%
s $19\frac{1}{6}$%

Page 98.

a $55.8
b $2500
c 23%
d $59.04
e $1900
f 29%
g 66 sheep.
h 759 sheep.
i 900 sheep.
j 828 sheep.
k 12%
l $33.95
m $451.05.
n $710
o 33%
p 6%

Page 99.

a 54523 lb.
b 7789 lb.
c $1678\frac{11}{30}$
d 2511
e 2511
f $6.65
g $3.20
h 1440 sq. rd.
i 9 acres.
j 152 rd.
k $\frac{17}{19}$
l $\frac{19}{17}$
m $\frac{19}{21}$
n $\frac{21}{19}$
o $\frac{23}{23}$
p $\frac{23}{21}$

Page 100.

a $84.72
b $141.20
c $1.32
d $\frac{5}{19}$
e $\frac{7}{12}$
f $\frac{2}{15}$
g $1200
h $4140
i $5520

Page 101.

a 59 hr.
b 62 hr.
c 70 hr.
d 61 hr.
e 60 hr.
f 67 hr.
g 62 hr.
h 52 hr.
i 65 hr.
j 47 hr.
k 5.9 da.
l 6.2 da.
m 7.0 da.
n 6.1 da.
o 6 da.
p 6.7 da.
q 6.2 da.
r 5.2 da.
s 6.5 da.
t 4.7 da.
u $11.80
v $15.50
w $21.00
x $12.20
y $14.40
z $23.45
aa $16.12
bb $13.52
cc $19.50
dd $10.34
ee 102 hr.
ff 102 hr.
gg 95 hr.
hh 90 hr.
ii 98 hr.

jj 118 hr.
kk 605 hr.
ll 60.5 da.
mm $157.83

Page 102.

a $1748\frac{7}{40}$
b $1161\frac{27}{40}$
c $3788\frac{7}{11}$
d $107\frac{7}{20}$
e $408\frac{3}{5}$
f $5856\frac{3}{5}$
g $1230\frac{3}{4}$
h 162
i $25\frac{5}{12}$ t's
j $241\frac{1}{4}$ t's
k $\frac{5}{8}\frac{3}{4}$
l $124\frac{7}{20}$
m $1375\frac{1}{4}\frac{9}{0}$
n $357\frac{1}{4}\frac{3}{0}$
o $20687\frac{1}{8}$
p $205\frac{6}{7}$ t's
q $248\frac{7}{12}$ t's

Page 103.

a 5424 t's
b 1891 t's
c 9360 t's
d 7512 t's
e 18750 t's
f 64100 t's
g 9680 t's
h $87\frac{1}{2}$ t's
i 2920 t's
j 14 t's
k $3.046
l $4.382
m 56.1 t's
n $56.1
o 561 t's
p $56.104
q $249.2
r $961.2
s 147 doz.
t $1.47
u $205.80
v $167.58

Page 104.

a 36¢
b $2.52
c $7.40
d $6.75
e 96 t's
f 40 t's

Page 105.

a 140 rd.
b 1200 sq. rd.
c $7\frac{1}{2}$ acres.
d $543.75
e $63
f 160 sq. rd.
g 2 acres.
h 1 acre.
i $5\frac{1}{5}$ acres.
j $4\frac{2}{5}$ acres.
k $6\frac{4}{5}$ acres.
l 3 cords.
m 3 cords.
n $2\frac{1}{8}$ cords.
o $5\frac{1}{4}$ cords.
p $133\frac{1}{3}$ sq. yd.
q $91\frac{2}{3}$ sq. yd.
r 42 sq. yd.
s $155\frac{5}{9}$ sq. yd.
t 24 cu. yd.
u 40 cu. yd.
v 60 cu. yd.
w 84 cu. yd.

Page 106.

a $\frac{3}{4}\frac{}{0}$ acre.
b $\frac{7}{4}\frac{}{0}$ acre.
c $\frac{9}{4}\frac{}{0}$ acre.
d 72 in.
e 128 sq. rd.
f $100.64
g $2.20
h $290

Page 107.

a $72.90
b $83.22
c $3.978
d 8500
e 14600
f 8300
g 6700
h 5200
i 5600
j 29%
k $23\frac{1}{3}$%
l 49%
m 95%
n 64%
o 96%

p 38.7
q 2400
r 46%

Page 108.

a 52 trees.
b 598 trees.
c 1400 bu.
d 1302 bu.
e 14%
f 86%
g $100
h $1150
i $1350
j 18%

Page 109.

a $45
b $2.25
c $270
d $1215
e 70 t's
f 70 t's
g $1.60
h 33¢
i $5.25
j 800 sq. rd.
k 5 acres.
l 114 rd.
m $39.90
n $6.25
o .68
p .76

Page 110.

a 6 tons.
b 12000 lb.
c 4 loads.
d 191 ft. 4 in.
e $2380
f $4760
g $\frac{1}{2}$
h 192 rd.
i $67.20
j 2048 sq. rd.
k $12\frac{4}{5}$ acres.
l $352
m 34.88

Page 111.

a 361
b 380
c 14814
d 236358
e 429088
f 226632
g 202592
h 174375
i 175467
j 110124
k 235935
l 115648
m 254286
n 117440
o 168250
p $146\frac{1}{2}$
q $256\frac{1}{7}$
r $173\frac{1}{6}$
s $235\frac{1}{4}$
t $175\frac{1}{5}$
u $207\frac{1}{2}$
v $134\frac{1}{2}$
w $236\frac{1}{3}$
x $181\frac{1}{3}$
y $238\frac{3}{4}$
z $146\frac{2}{3}$
aa $324\frac{1}{3}$
bb $255\frac{1}{5}$
cc $209\frac{2}{9}$
dd $53\frac{1}{2}$
ee $37\frac{1}{4}$
ff $45\frac{1}{8}$
gg $75\frac{3}{4}$
hh $19\frac{1}{4}$
ii $27\frac{1}{2}$
jj $33\frac{3}{4}$
kk $55\frac{1}{12}$
ll $40\frac{1}{4}$
mm $89\frac{1}{4}$
nn $73\frac{3}{4}$
oo $37\frac{1}{5}$

Page 112.

a $2359\frac{11}{36}$
b $2226\frac{1}{2}$
c $447\frac{7}{8}$
d $3764\frac{4}{9}$
e $3378\frac{3}{5}$
f $1922\frac{4}{5}$
g $3100\frac{1}{2}$
h $1568\frac{7}{10}$
i $2312\frac{1}{5}$
j 58
k $21\frac{1}{5}$
l $50\frac{2}{5}$
m $55\frac{1}{15}$
n $192\frac{7}{18}$

o $208\frac{7}{18}$
p $198\frac{2}{5}$ mi.
q 248 mi.
r $12\frac{2}{5}$ mi.
s $37\frac{1}{5}$ mi.
t $210\frac{4}{5}$ mi.
u $285\frac{1}{5}$ mi.
v $36\frac{8}{13}$ t's

Page 113.

a $241.5
b $1966.5
c $27.60
d $9660
e $1131.60
f $1.725
g $8.625
h $112.125
i 72 t's
j $72
k 720 t's
l 7200 t's
m $34.20
n $8\frac{1}{2}$ tons
o $4.25

Page 114.

a $37.50
b $45.00
c $40
d $39.15
e $52.65
f $36.45
g $31.85
h $33.15
i $39.65
j $30.50
k $31.00
l $31.50
m 30.25

Page 115.

a 238 sq. ft.
b 297 + sq. ft.
c 62 ft.
d 17 ft.
e 5 strips.
f $\frac{1}{3}$
g 85 ft.
h $28\frac{1}{3}$ yd.
i $17
j 4 ft.
k $17.80
l $11.60

Page 116.

a $\frac{3}{80}$
b $\frac{1}{32}$
c $\frac{1}{16}$
d $\frac{3}{32}$
e $\frac{1}{8}$
f $\frac{3}{16}$
g 34 ft.
h 50 rd.
i $4.95
j 112.95

Page 117.

a $1269
b $423
c $720
d $432
e $570
f $380
g $280
h $840
i $336
j $560
k $350
l $525
m 50%
n 25%
o 20%

Page 118.

a $1075
b $645
c $960
d $1120
e 25%
f 20%

Page 119.

a 528
b 900
c 16
d 16
e $.37\frac{1}{2}$
f .375
g $.62\frac{1}{2}$
h .625
i $.87\frac{1}{2}$
j .875
k $18.00
l $19.80
m $18.36
n $18.72
o 44¢

p $3.52
q $1.80
r 15¢
s 28⅓ yd.
t $25.50

Page 120.

a 540 sq. mi.
b $5.05
c $1.70
d 25¢
e $28
f $896

Page 121.

a 4154
b 3257
c 7780
d 3760
e 7784
f 9992
g 578
h 597
i 18951
j $904.75
k $742.60
l $1629.40
m $831.85
n $4108.60
o $1167.60
p $2498
q $144.50
r $298.50
s $4108.60
t 180 da.
u 234 da.

Page 122.

a $\frac{2}{3}$
b $\frac{34}{55}$
c $\frac{47}{113}$
d $\frac{3}{8}$
e $46\frac{7}{8}$
f 68
g $38\frac{2}{3}$
h $46\frac{1}{3}$
i $\frac{391}{7}$
j $\frac{373}{5}$
k $\frac{776}{9}$
l $\frac{582}{8}$
m $\frac{40}{72}$, $\frac{63}{72}$
n $\frac{42}{77}$, $\frac{33}{77}$
o $\frac{25}{60}$, $\frac{15}{60}$
p $\frac{282}{6}$
q $\frac{22}{45}$
r 48 vests.

Page 123.

a $.333\frac{1}{3}$
b $.666\frac{2}{3}$
c $.166\frac{2}{3}$
d $.833\frac{1}{3}$
e $.142\frac{4}{7}$
f $.285\frac{5}{7}$
g $.428\frac{4}{7}$
h $.571\frac{3}{7}$
i $.714\frac{2}{7}$
j $.857\frac{1}{7}$
k $.111\frac{1}{9}$
l $.222\frac{2}{9}$
m $.444\frac{4}{9}$
n $.555\frac{5}{9}$
o $.777\frac{7}{9}$
p $\frac{1}{8}$
q $\frac{3}{8}$
r $\frac{5}{8}$
s $\frac{7}{8}$
t $\frac{7}{40}$
u $\frac{9}{40}$
v $\frac{13}{40}$
w $\frac{27}{40}$
x $427.5
y $1377.5
z $37.38
aa $197.58
bb $1265.58
cc $1.602
dd $22.962
ee $129.762
ff 90.5 t's
gg $90.5
hh 905 t's
ii 9050 t's
jj $46.25

Page 124.

a $17.20
b $5
c $86
d $25.00
e $10.75
f $3.25
g $9.72
h $2.25
i $8.91
j $2.09
k $210.60

l $5.59
m $10
n $129.48
o $1.80
p $4.20

Page 125.

a 2000 sq. ft.
b 222⅔ sq. yd.
c 180 ft.
d 60 yd.
e 220 ft.
f 73⅓ yd.
g 40 ft.
h 1000 sq. ft.
i 111⅑ sq. yd.
j $60
k 28⅓ yd.
l 28 yd.

Page 126.

a $7.65
b $5.85
c $41
d $2.10
e $7

Page 127.

a $798
b $342
c $973
d $695
e $968
f $484
g $175
h $1385
i $564
j $774
k 40%
l 16⅔%
m 33⅓%

Page 128.

a 25%
b 33⅓%
c 484 bu.
d $38.50
e $57.75
f $3.70

Page 129.

a 102 da.*
b 135 da.
c 80
d 80
e .22⅔
f .222⅔
g .44⅘
h .444⅘
i .55⅚
j .555⅚
k $\frac{3}{20}$
l $\frac{17}{20}$
m $\frac{13}{20}$
n ¾
o $\frac{11}{20}$
p $45.60
q $3.12
r 140 ft.
s 172 ft.
t 1200 sq. ft.
u 624 sq. ft.
v $5.25
w $4.05

Page 130.

a 792 sq. in.
b $12.87
c $1061.10
d 1310 lb.
e 1440 sheets.
f $404.76
g $1.75

Page 131.

a 7612
b 4023
c 3438
d 63
e 23
f $3942
g $1104

Page 132.

a 738 ft.
b 738¾
c 739½
d 768 ft.
e 769⅓
f 770⅔
g $103.50
h $51.75
i $34.50

* Solve as follows: 5+31+30+31+5=102.

j 625 bu.
k 230 bbl.
l $706\frac{1}{4}$ *

Page 133.

a $569.50
b $465.
c $326.95
d $765.70
e $195.75
f $464.64
g $1415.10
h $3413.10
i $327.075
j $2284.75
k $142.245
l $293.202
m $430.56
n $8310.60
o $1356.16
p $138.125
q $270.088

Page 134.

a 50 da.
b Saturday.
c Tuesday.
d 12 wk. 1 da.
e 9 wk. 3 da.
f 11 wk. 2 da.
g 15 wk. 6 da.
h 7 wk. 2 da.
i 7 wk. 6 da.
j 15 wk. 3 da.
k 9 wk. 6 da.

Page 135.

a 72 ft.
b 51 ft.
c 18 ft.
d 18 ft.
e 6 ft.
f 36 ft.
g 30 ft.
h 24 ft.
i 15 ft.
j 6 ft.
k $36.72
l $1275

Page 136.

a $46.25
b $1500
c $47\frac{1}{2}$ mi.
d 318 t's
e 19080 t's
f ——
g 96¢
h $1104

Page 137.

a $1093.50
b $850.50
c $929.50
d $760.50
e $845.
f $455
g $664
h $992
i $520
j $810
k $230
l $850
m 30%
n $12\frac{1}{2}$%
o 10%

Page 138.

a 13000
b $5460
c 50%
d $33\frac{1}{3}$%
e $5760 †
f $4240 ‡
g 620 gal.

Page 139.

a 997
b 36
c $1916\frac{3}{4}$
d $2265.25
e $348.50
f Thursday.
g $387\frac{1}{2}$ mi.

Page 140.

a 3888 sq. in.
b 27 sq. ft.

* 12 acres cost 12 times $56\frac{1}{4}$; $\frac{1}{4}$ acre cost $\frac{1}{4}$ of $56\frac{1}{4}$.
† $4320 is $\frac{3}{4}$ of the cost.
‡ $5300 is $\frac{5}{4}$ of the cost.

c $1050
d 139 lb.
e 2304 sq. ft.
f 256 sq. yd.
g $28\frac{4}{7}$ hr.
h $129.75
i $6375
j $5100

Page 141.

a 14920
b 31520
c 164100
d 583800
e 29.7
f 25.3
g 18.2
h 35.4
i $150
j $5

Page 142.

a $1\frac{2}{10}$
b $2\frac{3}{25}$
c $41\frac{7}{8}$
d $52\frac{8}{9}$
e $2\frac{57}{9}$
f $2\frac{81}{6}$
g $\frac{661}{7}$
h $1\frac{037}{12}$
i $1\frac{7}{24}$
j $\frac{29}{30}$
k $1\frac{7}{60}$
l $\frac{1}{18}$
m $\frac{7}{30}$
n $\frac{19}{60}$
o $\frac{5}{12}$
p $\frac{15}{44}$
q $\frac{12}{35}$
r $2\frac{4}{9}$ t's
s $5\frac{1}{3}$ t's
t $2\frac{4}{25}$ t's
u $5164\frac{1}{4}$
v $371\frac{1}{3}$ t's
w $72\frac{19}{27}$

Page 144.

a 500 lb.
b 6520 lb.
c 9400 lb.
d 1.632 tons.
e 2.812 tons.
f $26.68
g $25.46
h 462 ft.
i 2240 rd.
j 92 rd.
k 9 mi.
l $6.30
m 60 bu.
n $15
o 440 ft.
p 26400 ft.
q 3840 sheets.
r 384 sheets.
s 190 quires.
t 135 quires.

Page 145.

a 25 ft. square.
b 225 sq. ft.
c 3375 cu. ft.
d 320 cu. ft.
e 400 sq. rd.
f $67\frac{1}{2}$ cu ft.

Page 146.

a $\frac{25}{36}$
b $\frac{9}{16}$
c $\frac{1}{4}$
d $\frac{1}{9}$
e $\frac{27}{125}$
f $\frac{1}{8}$
g $\frac{1}{27}$
h $\frac{1}{8}$
i 64 t's
j $\frac{4}{9}$
k $\frac{1}{9}$
l $97.20

Page 147.

a $869.75
b $13916
c 20%
d $81.25
e $5200
f $14\frac{2}{7}$%
g $72.50
h $7250
i $12\frac{1}{2}$%
j $504
k $1134.
l 75%
m $486
n $1350

o 40%
p $512
q $800
r $83\frac{1}{3}$%
s $216
t $1536
u 90%

Page 148.

a 46.41
b 3300
c 8%
d 62.56
e 7500
f 5%
g 25%
h 20%
i 50%
j $16\frac{2}{3}$%
k 20%.
l $33\frac{1}{3}$%
m 80%
n $66\frac{2}{3}$%
o 125%
p $83\frac{1}{3}$%
q 150%
r 120%

Page 149.

a .750
b .875
c $\frac{11}{40}$
d $\frac{3}{8}$
e $\frac{17}{40}$
f $\frac{23}{40}$
g $\frac{5}{8}$
h $17.27
i $23.35
j 1.25
k 12.5
l 125
m 7.2
n 72
o 720
p 7200
q 8.18
r 81.8
s 818
t 8180
u 2.7
v 27
w 270
x 2700
y .27
z 2.7

Page 151.

a 2, 5, 19
b 2, 3, 7
c ——
d 196
e 97
f 420
g 846

Page 152.

a $31\frac{1}{2}$ bu.
b $336
c $266\frac{2}{3}$
d $34.80
e $1027\frac{2}{3}$ ft.
f $44\frac{11}{16}$ in.
g $138\frac{2}{3}$ ft.
h $14\frac{7}{12}$ ft.
i $13\frac{15}{16}$ in.
j $15\frac{11}{16}$ in.
k $109\frac{2}{3}$ ft.
l $152\frac{5}{6}$ ft.
m $173\frac{1}{8}$ in.
n $368\frac{1}{4}$ in.
o 5 t's
p 7 t's
q 4 t's
r $5\frac{1}{2}$ t's
s $5\frac{11}{20}$ ft.
t $7\frac{11}{18}$ ft.
u $11\frac{5}{12}$ in.
v $7\frac{11}{32}$ in.

Page 153.

a 15.6
b 1.56
c 156
d 15.6
e 1.56
f 156
g .156
h 1.56
i .0156
j 15.6
k 156
l 156
m 1560
n 15600
o 156000

Page 155.

a 86 ft.
b 85 ft.
c 112 ft.
d 68 ft.
e 85 ft.

Page 157.

a $205.39
b $2800
c 23%
d $252.54
e $5300
f 11%

Page 158.

a $70.16
b $105.24
c $336.50
d $201.90
e 25%
f $16.53
g $460
h 3%
i $17.82
j $630
k 5%

Page 159.

a 810
b 3, 5, 17
c 5, 5, 13
d $50.40
e 70 bu.
f 1.74 t's
g 174 t's
h 17.4 t's
i 1740 t's
j 174 t's
k 17.4 t's
l 18 + cm.
m More.
n 63 ft.
o $548

Page 160.

a 330 t's
b 160 cu. yd.
c 560 sq. ft.
d 31 bu.
e 144
f 1728
g $\frac{1}{8}$ acre.
h $16.96
i $3.76
j $9.18
k $1152
l $288
m $1.05
n 1092 cu. ft.
o $228

Page 161.

a { 2, 2, 2, 2, 3, 3, 5
  { 2, 2, 2, 2, 3, 3
  { 5 times.

b { 2, 2, 2, 2, 2, 2, 5
  { 2, 2, 2, 2, 2, 2
  { 5 times.

c { 2, 2, 2,3, 3, 5
  { 2, 2, 3, 5
  { 6 times.

Page 162.

a 30 t's
b 37$\frac{1}{2}$ bu.
c 30 bu.
d 25$\frac{3}{5}$ t's
e 32 mi.
f 25$\frac{3}{5}$ mi.
g 24 bu.
h 48 bu.
i $3.25
j $6.50

Page 163.

a 40 t's
b 42 bu.
c 40 bu.
d 30 t's
e 40$\frac{1}{2}$ mi.
f 30 mi.
g 7 bu.
h 70 bu.
i 45¢
j $4.50

Page 165.

a 368 ft.
b 592 ft.
c 1120 ft.
d 1348 ft.
e 75 ft.
f 89 ft.
g 100 ft.
h 1000 in.
i 83$\frac{1}{3}$ ft.

Page 166.

a 64
b 30
c 5
d 51
e $\frac{1}{51}$
f $6\frac{1}{4}$
g $5\frac{1}{3}$
h $\frac{3}{20}$
i 64
j 4

Page 167.

a 183.26
b 1440
c 7%
d 248.64
e 400
f 7%

Page 168.

a $2800
b $14
c $2814
d $3000
e $15
f $2985
g $171
h $1000
i 5000 bu.
j $1005
k $1200
l 2000 bu.
m $1194
n $\frac{3}{4}$%
o 3000 bu.
p $1209
q $9.51
r $640
s 3%

Page 169.

a 1200 sq. cm.
b 592 ft.
c 848 ft.
d 840 ft.
e 284 ft.

Page 170.

a 55 days.
b 33 da.
c 660 ft.
d $48\frac{1}{4}$ bu.
e $24.85
f 40 rd.
g 8 acres.
h 1760
i 138 days.
j 11200 rd.
k 35 mi.
l 100
m 2 t's
n 352 sq. ft.
o 1560 sq. ft.
p 1680 sq. yd.

Page 171.

a 360
b 16800
c 20196
d 11592
e 360
f 720
g 70 t's
h 63 t's
i 45 t's

Page 172.

a $\frac{15}{200}$, $\frac{36}{200}$?
b $\frac{21}{72}$, $\frac{2}{72}$?
c $\frac{28}{72}$, $\frac{15}{72}$?
d $\frac{44}{144}$, $\frac{27}{144}$?
e $\frac{7}{72}$
f $\frac{5}{72}$
g $\frac{7}{144}$
h $\frac{9}{200}$
i $\frac{1}{45}$
j $\frac{2}{75}$
k $\frac{1}{48}$
l $\frac{1}{600}$
m $7\frac{1}{2}$
n $4\frac{2}{5}$
o $7\frac{1}{2}$
p 3.3

Page 173.

a $42
b $65
c $75
d $37

Page 174.

a 216 cc.
b 343 cc.
c 512 cc.
d 1760 yd.
e 180 ft.

f 66 yd.
g $25\frac{5}{11}$ rd.
h 220 yd.
i 330 ft.
j 3300 in.
k 45 ft.
l 5280 ft.
m 2340 in.
n 5280 ft.

Page 175.

a 132 ft.
b 142 ft.
c 155 ft.*
d 101 ft.

Page 176.

a $\frac{1}{12}$
b $\frac{1}{11}$
c $\frac{2}{9}$
d $\frac{1}{3}$
e $\frac{1}{3}$
f $47.25
g $\frac{1}{3}$
h $4.05
i 81 ounces.

Page 177.

a 380.8
b 700
c 5%
d 315.35
e 600
f 8%
g 800
h 2%
i 3%

Page 178.

a 37.45 bu.
b 25%
c 20%
d $6500
e 12%
f A $92
B $20.70
C $2.07
D $138
E $14.95
F $2.53
g G $60
H $15
I $1.60
K $100
L $12
M $2.40
h 20%

Page 179.

a 84
b 240
c $\frac{17}{48}$
d $\frac{37}{48}$
e $\frac{13}{48}$
f $\frac{29}{48}$
g $7\frac{1}{2}$ t's
h $8\frac{1}{4}$ t's
i $2.50
j $5.00
k $63
l $52
m $46.50
n $4.50
o 88 ft.
p 225 ft.
q $5\frac{1}{3}$
r $ .80

Page 180.

a 48 rd.
b 360 ft.
c $20.25
d $26
e 30 mi.
f 20
g $2.40
h 290.4
i 10 cords.
j $\frac{1}{9}$

Page 181.

a 240
b 15 t's
c 8 t's
d 25

* If the boards were 12 feet long they would contain 116 feet of lumber; 16-foot boards contain one-third more lumber than 12-foot boards of the same width; one-third of 116 ft. is nearly 39 ft.; 116 ft. + 39 ft. = 155 ft.

e 7
f 12
g 15
h 12
i 22
j \$4166⅔
k 2416 sheep.
l 4832 sheep.
m \$11.20

Page 182.

a $\frac{4}{7}\frac{3}{2}$
b $\frac{7}{9}\frac{6}{0}$
c $\frac{4}{1}\frac{1}{4}\frac{1}{4}$
d $\frac{3}{4}\frac{1}{8}$
e $\frac{1}{1}\frac{3}{4}\frac{3}{4}$
f $\frac{2}{2}\frac{2}{5}\frac{7}{8}$
g $\frac{3}{2}\frac{}{0}$
h $\frac{2}{7}\frac{6}{5}$
i $\frac{1}{2}\frac{1}{0}\frac{1}{0}$
j $\frac{3}{1}\frac{7}{8}\frac{}{0}$
k $\frac{3}{7}\frac{7}{2}$
l $\frac{1}{7}\frac{3}{2}$
m $7\frac{2}{9}$
n $3\frac{1}{3}$
o $3\frac{3}{1}\frac{}{0}$
p $3\frac{7}{1}\frac{}{5}$
q $2\frac{1}{1}\frac{4}{5}$
r $2\frac{1}{1}\frac{1}{4}$

Page 183.

a \$152.50
b 305 t's
c \$52.50
d 105 t's
e \$315
f 630 t's
g \$114
h 912 t's
i \$153
j 306 t's
k \$12.60
l 25.2 t's
m \$10.90
n 21.8 t's
o \$13.20
p 26.4 t's
q \$6.90
r 13.8 t's
s \$6.50
t \$32.50
u \$31.20

Page 184.

a 576 sq. in.
b 6 sq. ft.
c 2¼ sq. ft.
d 1152 sq. in.
e 45 sq. ft.
f 102 sq. yd.
g 7 acres.
h 1440 sq. rd.

Page 185.

a 131 ft.*
b 83 ft.
c 142 ft.†
d 95 ft.

Page 186.

a \$46.40
b 35460 lb.
c \$74
d 110 rd.
e \$47.25

Page 187.

a \$950.68
b 292½
c \$172.50
d 25⅓
e \$486.90
f 126¾
g \$310
h 58
i \$432.75
j 107½
k \$196
l 60
m 85%
n 24%
o 46%
p 75%

Page 188.

a 6% gain.
b 8% loss
c \$1002.51
d \$453.90

*70 + 35 = 105; 105 ÷ 4 = 26; 105 + 26 = 131.
†71 + 24 = 95; 95 ÷ 2 = 47; 95 + 47 = 142.

e $96
f $160
g $213
h $546
i 6%
j 8%

Page 189.

a 120
b $\frac{17}{60}$
c $\frac{2}{15}$
d $2\frac{1}{9}$
e $8
f 8 lb.
g 13824 cu. in.
h 8000 cc.
i 87 ft.
j 120 ft.
k $341.25
l $270.25
m 20%
n $278.30
o $309.40
p $192
q $320
r $175

Page 190.

a 15 cows.
b $85
c $\frac{1}{15}$
d $80\frac{2}{5}$ lb.
e 440 t's
f $2.10
g $7.60
h 55 rd. 6 ft.
i 62 mi.
j $5\frac{2}{3}$ mi.
k $16.95

Page 191.

a 300
b 560
c 357
d 180
e 315
f 600
g 234
h 192
i 520
j 200
k 1560
l $633
m $5250
n $138
o $2358
p $117.90
q $17\frac{6}{7}$ da.

Page 192.

a 165
b $\frac{27}{65}$
c $\frac{83}{165}$
d $4\frac{17}{22}$
e $\frac{101}{112}$
f $\frac{59}{112}$
g $3\frac{17}{21}$
h $\frac{62}{99}$
i $\frac{26}{99}$
j $2\frac{4}{9}$
k 13 baskets.
l $13
m $165\frac{3}{4}$
n $45\frac{3}{8}$ acres.

Page 193.

a $5217
b 5217 t's
c $5200
d 10400 t's
e $945
f 945 t's
g $490
h 983 t's
i $150
j 300 t's
k $35
l 70 t's
m $54
n 54 t's
o $62
p 62 t's
q $36
r $288

Page 194.

a 65 liters.
b 65000 cc.
c 3456 cu. in.
d 13824 cu. in.
e 3 cu. ft.
f 9 sq. ft.
g 54 cu. ft.

Page 195.

a 532 ft.

b 520 ft.
c 125 boards.
d 165 "
e $30
f $51
g $42.12
h $9.20
i $2.17
j $30
k $7.35
l $3.45

Page 196.

a $52.50
b $3.75
c $15
d $13.75
e $\frac{4}{9}$
f $\frac{8}{27}$

Page 197.

a 652.5
b 847.5
c 520
d 520
e 7%

Page 198.

a $2.10
b $3.12\frac{1}{2}$
c $3.25
d Less.
e $12\frac{1}{2}$%
f $6000
g $6000
h 20%
i 25%
j $\frac{1}{4}$

Page 199.

a 255
b 75
c $\frac{2}{2}\frac{3}{5}\frac{2}{5}$
d $4\frac{7}{45}$
e $565
f 565 t's
g 200 liters.
h More.
i $301.50
j $114
k 6%
l 8%
m 15%
n 5%

Page 200.

a 27 bricks.
b 729 "
c 3456 "
d $4\frac{1}{2}$ "
e $40\frac{1}{2}$ "
f 450 "
g 72 pkgs.
h $21
i Apr. 15, '65.
j $6\frac{1}{3}\frac{8}{5}$ yd.
k $9.41
l 174 min.
m 3 hr. 1 min. 15 sec.
n $\frac{1}{10}$

Page 201.

a 4
b 7
c 24
d 64
e 128
f 3161
g 18
h 24 ft.
i 36 in.
j 25 ft.
k 9 ft.
l 12 in.

Page 202.

a 36
b $1\frac{7}{36}$
c $\frac{2}{3}\frac{3}{6}$
d $3\frac{3}{10}$
e 140
f $\frac{111}{140}$
g $\frac{69}{140}$
h $4\frac{2}{7}$
i 43 bu.
j $14
k $81.60
l $72.80
m $3.50
n 17 da.
o $11\frac{3}{4}$ yd.

Page 203.

a $75
b 75 sheep.
c 45 mi.
d 45 hr.

e $262.50
f $262.50
g 103.5 mi.
h 103.5 mi.
i $64
j 64 t's
k $43
l 43 t's

Page 205.

a 200 ft.
b 275 ft.
c 300 ft.
d 400 ft.
e 525 ft.
f 600 ft.
g 432 ft.
h 336 ft.
i 512 ft.
j 300 ft.
k 736 ft.
l 378 ft.
m 176 ft.
n 520 ft.
o 224 ft.
p 490 ft.

Page 206.

a $17.40
b $21.60
c $28.90
d $12\frac{1}{4}$
e $20\frac{1}{4}$
f 64
g 8
h 8
i 8

Page 208.

a $2.16
b $2.10
c $13.50
d $12.00
e $11.04
f $19.05
g $22.23
h 25%

Page 209.

a 24
b 15
c $436
d $450
e 800 ft.
f $12
g 256 ft.

Page 210.

a $148.32
b 42 sq. yd.
c $3400
d More.
e $12.30
f 19
g 50 cubes.
h 20 cubes.
i 40 cubes.
j 160 cubes.
k 120 cubes.
l 48 cubes.

Page 211.

a 14,864,680
b 128,114,376
c 45,821,803
d 507,434,147
e 17,255,367

Page 212.

a 80
b $\frac{567}{800}$
c $\frac{363}{800}$
d $3\frac{3}{4}$
e $12
f $240
g $4.50

Page 213.

a .171926
b 364.5533
c 1291.5730
d .329234
e 267.41483

Page 214.

a 1000 oz.
b 37.5 lb.
c $3\frac{1}{8}$ lb.
d 15 lb.
e 131.25 lb.
f 162.5 lb.
g 456.25 lb.

Page 215.

a 8 ft.
b 9 ft.
c 11 ft.

d 12 ft.
e 16 ft.
f 16 ft.
g 19 ft.
h 21 ft.
i 24 ft.
j 32 ft.
k 12 ft.
l 14 ft.
m 16 ft.
n 18 ft.
o 24 ft.
p 16 ft.
q 19 ft.
r 21 ft.
s 24 ft.
t 32 ft.
u 64 ft.
v 75 ft.
w 85 ft.
x 96 ft.
y 128 ft.
z $1.92
aa $7.245
bb $6.55
cc $3.78
dd $4.608
ee $9.31
ff $2.91
gg $9.75
hh 75c.

Page 216.

a More.
b Less.
c Less.
d Less.
e 225 gal.
f Less.*
g $\frac{1}{4}$
h $\frac{1}{4}$
i 48 mi.

Page 217.

a $86\frac{2}{3}\%$
b $86\frac{2}{3}\%$
c $13\frac{1}{3}\%$
d $117\frac{1}{7}\%$
e $117\frac{5}{7}\%$
f $17\frac{1}{7}\%$
g 8%
h 6%
i 5%
j 2%
k 15%
l 25%

Page 218.

a $19.50
b $344.50
c $11.04
d $287.04
e $30.60
f $370.60
g $19.50
h $279.50

Page 219.

a 5,929,353
b 175,893
c $4.40
d $2\frac{3}{8}$ cords.
e 274,999.725
f 42.027
g 50 lb.
h $46\frac{7}{8}$ lb.
i 240 ft.
j $3.60
k 20 cu. ft.
l 875 lb.
m $937\frac{1}{2}$ lb.

Page 220.

a 3400
b 60%
c 28125
d Less.
e 250 lb.
f $37\frac{1}{7}$ cu. ft.
g $45\frac{5}{11}$ cu. ft.
h $155.98
i 13 hr. 59 min.
j ——

Page 221.

a 869.73
b 1447.41
c 1050.74

* Using $7\frac{1}{2}$ as the ratio of a cubic foot to a gallon gives exactly 600 gallons; but since the true ratio is a little less than $7\frac{1}{2}$, the true answer to this problem is a little less than 600 gallons.

Page 222.

a $\frac{203}{248}$
b $\frac{665}{1692}$
c $\frac{855}{1992}$
d $\frac{699}{2117}$
e $22\frac{1}{6}$
f $40\frac{5}{8}$
g $62\frac{1}{2}$
h $83\frac{7}{8}$

Page 223.

a .375
b .625
c .875
d .35
e .833 +
f .225
g .775
h .6875
i .222 +
j .571 +

Page 224.

a 3375 lb.
b 6 cu. ft.
c $4\frac{1}{2}$ lin. ft.
d 146 loads.
e $4556\frac{1}{4}$ lb.
f $83\frac{1}{3}$ cu. ft.
g $3645\frac{5}{6}$ lb.
h $1302\frac{1}{12}$ lb. *
i $37\frac{1}{27}$ cu. ft.
j 4625 lb.
k Less.

Page 225.

a $155\frac{5}{9}$ sq. yd.
b 112 sq. yd.
c $58\frac{1}{3}$ sq. yd.
d 3392 ft.
e $50.88
f 212 b'ds.
g 7866 tiles.
h $157.32

Page 226.

a Less. †
b More.
c More.
d 192 bu.
e More. ‡
f $\frac{1}{9}$
g $\frac{1}{9}$
h $129

Page 227.

a $98\frac{1}{2}\%$
b 870 da.
c $96\frac{2}{3}\%$
d 685 da.
e $95\frac{5}{38}\%$
f 686 da.
g $92\frac{26}{37}$
h $860\frac{1}{2}$ da.
i 98 + %

Page 228.

a $32.50
b $36.25
c $37.50
d $73.96
e July 1, '96
f $270.32

Page 229.

a $\frac{699}{1885}$
b $\frac{855}{2068}$
c $92.48
d .55
e .275
f .1666 +
g $\frac{13}{40}$
h Less.
i 500 lb.
j 200 cu. ft.
k 960 gal.

* There are $41\frac{2}{3}$ cu. ft. of the lumber. Each foot weighs $31\frac{1}{4}$ lb. First find what 41 cu. ft. weigh; to this add the weight of $\frac{2}{3}$ of a cubic foot.

† Change $\frac{2}{5}$ to 855ths and compare.

‡ Using the ratio $\frac{4}{5}$ gives 224 bu. This is practically correct, though the exact mathematical answer ($8 \times 5 \times 7 \times 1728 \div 2150.4$) is a little more than 224 bushels.

l 625 cu. ft.
m 256 bu.
n $92\frac{1}{2}\%$
o 94 + %

Page 230.

a $558.14
b $330
c $\frac{1}{8}$
d $431.25
e $480

Page 232.

a $\frac{4}{5}$
b $2\frac{3}{16}$
c $\frac{21}{22}$
d $1\frac{7}{60}$
e $3\frac{17}{20}$
f $\frac{1}{3}$
g $14\frac{3}{8}$

Page 233.

a 511.401
b 79.875
c 127.505
d 347.094
e 360.36
f 951.5625
g 1101
h 54
i $286.65
j $23.375
k $75.206
l $177.625
m 36¢
n 2.28 tons.
o 4560 lb.
p 1.8 M.
q 1800 br'ks.
r 8.35 cwt.
s 835 lb.
t 3.2 hr.
u 6.4 rd.
v $6\frac{2}{3}$ rd.
w 3.2 rd.

Page 234.

a 94 ft. 3 in.
b 18 min. 20 sec.
c 543 bu.
d 598 gal.
e 10 wk. 3 d.
f 4 yr. 5 mo.
g $29\frac{1}{6}$ t's
h 1517 qt.
i 15340 lb.
j 11 bu. 2 pk.
k 31680 ft.
l $293\frac{1}{3}$ rev.
m $14.85
n $30
o $30

Page 235.

a $56\frac{1}{4}$ sq. in.
b $72\frac{1}{4}$ sq. in.
c $27\frac{5}{8}$ sq. in
d $90\frac{5}{8}$ sq. in.
e $127\frac{7}{8}$ sq. rd.

Page 236.

a $\frac{29}{48}$ ft.
b $\frac{1}{8}$ yd.
c $\frac{5}{9}$ yd.
d $\frac{1}{3}$ rd.
e $\frac{23}{32}$ lb.
f $\frac{5}{8}$ bu.
g $\frac{3}{4}$ mi.
h $\frac{3}{4}$ acre.

Page 237.

a $234.25
b $2\frac{1}{2}\%$
c $799\frac{1}{3}$ da.
d $97\frac{1}{2}\%$
e $30
f $297
g $14.85
h $268.15
i $175.92
j $169.28

Page 238.

a $58
b $53.30
c $77.916 +
d $33.066 +
e $60.42
f $50.76

Page 239.

a $24\frac{2}{3}$ bu.
b $29\frac{3}{5}$ lb.
c 2112 steps.
d $\frac{25}{44}$ mi.
e $10\frac{1}{8}$ sq. ft.
f $23\frac{5}{8}$ sq. rd.
g $\frac{49}{64}$ lb.
h $\frac{49}{66}$ rd.
i $\frac{49}{144}$ yd.

Page 240.

a 9 bricks.
b 79200 b'ks.
c 576 tiles.
d $8\frac{3}{8}$ rd.
e $3\frac{9}{22}$ mi.
f 75 bu.
g $5.50
h 408 hr.
i $20
j $57.60

Page 242.

a $\frac{85}{198}$
b $\frac{105}{168}$
c $\frac{1}{3}$
d $\frac{24}{65}$
e $\frac{6}{33}$
f $\frac{15}{187}$
g $\frac{31}{49}$
h $\frac{23}{34}$
i $1\frac{3}{31}$
j $\frac{245}{264}$

Page 243.

a .375 bu.
b .625 lb.
c .125 acre.
d .3125 mi.
e 12.8 rd.
f 13.5 ft.
g 57.6 in.
h 320 rd.
i 5 acres.

Page 244.

a 109 pk.
b 373 oz.
c 1001 qt.
d 147 yd.
e 286 pt.
f 131 ft.
g 1125 min.
h 208 da.
i 212 mo.
j 26400 ft.
k 10 min. 20 sec.
l 9 hr. 55 min.
m 7 ft. 4 in.
n 31 lb. 4 oz.
o $41.40
p $80\frac{1}{2}$ sq. in.
q 9 bu. 22 qt.

Page 245.

a 46 ft.
b 100 ft.
c $524.60
d $30\frac{1}{4}$ sq. yd.
e $272\frac{1}{4}$ sq. ft.
f $35\frac{5}{9}$ rd.
g $12\frac{1}{8}$ rd.

Page 246.

a $7276\frac{1}{2}$ cu. in.
b More.*
c 30 + bbl.
d Less.†
e $\frac{1}{116}$
f $\frac{1}{116}$
g $97.20
h $\frac{1}{5}$

Page 247.

a $\frac{4}{25}$
b 16%
c 24%
d 20%
e 20%
f $1020
g $16.50

Page 248.

a $50.75
b $650.75
c $48.30
d $498.30
e $24.40
f $384.40
g $72.58 +
h $722.58 +
i $20.547 +
j $32.31 +
k $30.92

* 7276.5 cu. in. ÷ 1728 cu. in. = 4.2 +.

† Using $4\frac{1}{8}$ as the ratio of a barrel to a cubic foot, gives exactly 20 barrels; but since the true ratio is a little more than $4\frac{1}{8}$, the true answer is a little less than 20 barrels.

l $42.21 +
m $13.19
n $19.48
o $32.10
p 56.73
q $61.80
r $34.48
s $290.16
t $405.75
u $477.68

Page 249.

a .15 A. each.
b $\frac{3}{20}$ A. each.
c 1872 watches.
d 2112 t's

Page 250.

a 824 sq. ft.
b 2240 cu. ft.
c $120.96
d $27.00
e $9.10
f $8070
g 91 + bbl.
h $\frac{11}{63}$
i 75%
j 611 bu.

Page 251.

a 2025
b 1156
c 5329
d 576
e 1225
f 3136
g 5625
h 15625
i 640000
j 116964
k $\frac{25}{256}$
l $\frac{49}{576}$
m $\frac{64}{1225}$
n 1.44
o 6.25
p 40.96
q 11.56 sq. in.

Page 253.

a 2.143
b 5121.6
c 10.77
d 30608
e .0932
f 361.70
g .442
h 145
i .26315
j 76140
k .5492
l 4338.6

Page 254.

a 43 yd. 1 ft.
b 41 bu. 2 pk.
c 78 lb. 10 oz.
d 177 gal. 2 qt.
e 21 min. 15 sec.
f 5 mi. 136 rd.
g 76 rd. 10 ft.
h 27 hr. 4 min.
i 11 wk. 1 da.
j 14 m. 9 dm.
k 1470 ft.
l 246½ fth.
m $81.90

Page 255.

a 17 acres.
b 20 acres.

Page 256.

a 19.5 + sq. in.*
b 28.08 + sq. in.
c 38.22 + sq. in.
d 49.92 + sq. in.
e 63.18 + sq. in.
f 78 + sq. in.

Page 257.

a $41.; 8⅓%
b $71.96 +; 15$\frac{3}{20}$%
c $74.10; 21⅔%
d $89.05; 13$\frac{7}{10}$%
e $125.33; 15$\frac{1}{10}$%
f $101.38
g $57.80
h $70.81 +

* The ratio is really a little more than .78 (.785398 +); hence the exact answer is a little more than the one given.

Page 258.

a $397.50
b $371.44 +
c $468.70
d $376.74
e $640.26 +

Page 259.

a 7.29
b 7.84 sq. ft.
c 880 fth.
d 100 acres.
e 200 rd.
f 80 rd.
g 1579.50 + sq. ft.

Page 260.

a 8
b $1.47
c 1998
d 1092 strokes.
e ——
f $784, $841
g $85, $510

Page 261.

a 14
b 22
c 18
d 35
e 20
f 40
g 24 ft.

Page 263.

a 2.2
b 1.8
c 1.5

Page 264.

a 2.4 acres.
b 2.6 acres.
c 4.5 acres.
d 4 acres.
e 1.92 acres.
f 6.3 acres.
g 1.8 acres.
h 11.47 acres.
i 80 ch.
j 320 ch.
k 160 ch.
l 3 ch.

Page 265.

a 84 mi.
b 40 acres.
c 5 mi.
d 23040 A.

Page 266.

a 65 + cu. in.*
b 112.32 + cu. in.
c 178.36 + cu. in.
d 266.24 + cu. in.
e 379.08 + cu. in.
f 520 + cu. in.

Page 267.

a $1243.75
b $455.40

Page 268.

b $194.879 +
c $142.98 +

Page 269.

a 729
b 55
c $1\frac{13}{32}$ acres.
d 24 centals.
e 45 centals.
f $1875
g 26 + lb.
h 32.5 + lb.

Page 270.

a $1329.40
b $210.93 +
c $3231.20
d $3066
e $3090, $5150
f $24.75
g $41\frac{2}{3}$ da.
h 80¢
i 144 farms.
j $1,036,800
k 432 ft.

* This is something more than 65 cu. in. because the ratio is something more than .52.

BOOK III.

Pages 11 to 20.—These pages should be read aloud in class and the pupils should be encouraged to comment upon the statements and to discuss their meaning. It is not necessary that much time should be spent in memorizing the exact language of the book; see rather that pupils become familiar with *the use of all new terms* and that they *apprehend the facts stated.*

ANSWERS.

Page 13.

a 421942.401

Page 18.

Art. 21.

1. 15
2. 11
3. 23
4. 9
5. 80
6. 240
7. 90
8. 50

a 518

Art. 22.

1. 72
2. 32
3. 104
4. 44
5. 5
6. 12
7. 4
8. 7

b 280

Page 20.

1. $5a$
2. $b \div 4$
3. Shorter.
4. 199.8
5. 6; 9; 12.
6. 6; 9; 12.
7. 3
8. 1000
9. 38
10. $\begin{cases} 59 \\ 295 \end{cases}$

Page 23.*

1. 23277
2. 26723
3. 25001
4. 24999
5. 3600
6. 3578
7. 4400
8. 4422

a 116000*

Page 24.

1. 334.012
2. 865.988
3. 2.19576
4. 2.80424
5. 140.0736
6. 259.9264
7. 200.212
8. 799.788

a 2605

Page 25.

1. $3207.98

* Encourage pupils to make great effort to find these sums and the *sum of the sums* without assistance or comparison of answers, and *on first trial.* Put great emphasis upon accuracy.

2. $4019
3. $5981
4. $6792.02
a 20000

Page 26.

1. 93 bu. 0 pk. 1 qt.
2. 56 bu. 3 pk.
a 149 bu. 3 pk. 1 qt.

Page 27.

1. $10x$
2. $6x$
3. $8a$
4. $5b$
5. $6c$
6. $9ab$
7. $3ab$
8. $4bc$
9. $6bx$
10. $5b$

Page 28.

Art. 54.

4. $11a$
5. $6b$
6. $-4ab$

Art. 55.

4. $13a$
5. $8b$
6. $-4c$

Art. 56.

1. $24 + 13 + 1$
2. $13a + 4b + c$
3. $9ab + 8bc$

Page 30.

1. 60°; 30°; 90°.
2. 30°; 90°; 120°.
3. $192.22

Page 33.

1. 23186
2. 23186
3. 76814
4. 10000
5. 10000
6. 4889
7. 4889
8. 5111
a 158075

Page 34.

Art. 82.

1. 99.6544
2. 94.754
3. 55.764
4. 99.3456
5. 95.246
6. 55.236
7. 90.37
8. 213.25
9. 109.63
10. 86.75
a 1000

Art. 83.

1. 2.3943
2. 10
3. 7.6057
4. 5.4034
5. 2.3256
b 27.729

Page 35.

A $260.50
B $152.67
C $423.90
D $562.93
E $1.00
F $64.00
a $1465.

Page 36.

Art. 87.

1. 6 yd. 2 ft. 5 in.
2. 3 yd. 0 ft. 8 in.
3. 6 yd. 1 ft. 5 in.
4. 2 yd. 1 ft. 9 in.
5. 1 yd. 1 ft. 11 in.
6. 3 yd. 0 ft. 7 in.
7. 6 yd. 2 ft. 4 in.
8. 3 yd. 1 ft. 7 in.
9. 7 yd. 1 ft. 3 in.
10. 8 yd. 1 ft. 1 in.
a 50 yards.

Art. 88.

1. 6 days.
2. 15 days.
3. 25 days.
4. 37 days.
5. 46 days.
6. 66 days.
7. 71 days.
8. 138 days.
a 404 days.

Page 37.

Art. 90.

4. $6a$
5. $5b$
6. $-10c$

Page 38.

1. $\begin{cases} 7a+2b \\ 8a+2b \end{cases}$
2. $\begin{cases} 9a+18b \\ 9a+8b \end{cases}$
3. $\begin{cases} 9a-14b \\ 13a-14b \end{cases}$
4. $\begin{cases} 3a-4b \\ 12a-6b \end{cases}$

Page 40.

1. 90°
2. 45°
3. 45°
4. 45°
5. 60°
6. 30°
7. 419060 lb.
   209.53 T.

Page 43

1. 87507
2. 182493
3. 155808
4. 204192
5. 187866
6. 352134
7. 264328
8. 475672
9. 102109
10. 187891

a 2200000

Page 44.

1. 227.22
2. 87.642
3. 876.42
4. 8764.2
5. 1752.84
6. 17528.4
7. 155.808
8. 2044.98
9. 996.522
10. 25.968

a 32460

Page 45.

Art. 113.

$434.31

Page 46.

Art. 115.

1. 25 rd. $15\frac{1}{2}$ ft.
2. 164 rd. 12 ft.
3. 50 rd. 3 ft.
4. 14 rd. 6 ft.
5. 13 rd. $2\frac{1}{2}$ ft.

a 268 rd. 6 ft.

Art. 116.

1. 7 hr. 40 min. 25 sec.
2. 133 bu.
3. 2.9 + mi.

Page 47.

Art. 118.

1. $6abd - 4bcd + 10cd$
2. $10ax + 20bx - 5y$
3. $9bcd + 3abd - 3bcd$
4. $3abx - 3aby + 3abz$
5. $2axy + 2bxy - 2cxy$
6. (1) 220
   (2) 460
   (3) 330
   (4) 162
   (5) 84

Page 48.

Art. 120.

1. 25
2. 294
3. 576
4. 60
5. 462
6. 36
7. 152
8. 52
9. 522
10. 1152

a 3331

Art. 121.

1. 320
2. 3006

Page 49.

5. 1 and 3
6. 1 and 2
7. 2 and 4
8. 3 and 4
9. All.

10. All.
11. Yes.
12. Fig. 1

Page 50.

1. 80°, 100°, 100°
2. 70°, 110°, 110°
3. 4 rt. ang.
4. a^2 sq. ft.
5. a^3 cu. ft.
6. $7(b - c)$ dol.
7. 112 in.
8. Equal. 2 rd. more.

Page 53.

1. 1908
2. 1197
3. 1619
4. 913
5. 2195
6. 18
7. 49
8. 15
9. 15
10. 25
a. 7954

Page 54.

1. 425
2. 1874
3. 3.06
4. 34.8
5. 728.
6. .24
7. 229.333 +
8. 118.125
9. 500
10. 250
a. 4162.558 +

Page 56.

1. 519 rd. 6 in.
2. 7 rd. 9 ft. 8 in.
3. 14.07 t's
4. $14.07
5. $1407
6. 140.7 t's
7. $140.7
8. 1407 t's
9. $128.3544
10. $1283.544
11. $12835.44
12. $620.01
13. $620.01
14. No.
15. Yes.

Page 57.

Art. 142.

1. $3a^4b$
2. $2a^3b^2$
3. $4a^2b^3$
4. $5ab^4$
5. $(3a^4b + 2a^3b^2 - 4a^2b^3 + 5ab^4)$
6. 7440

Page 58.

3. $708 \div 12 = 59$
6. $3690 \div 45 = 82$
9. $30 \div 6 = 5$
12. $20 \div 2 = 10$
15. $-324 \div 12 = -27$*

Page 60.

1. 45°
2. 45°
3. 105°
4. b ft.
5. c ft.
6. $12 \div 3 = 4$; $24 \div 12 = 2$
7. 62 rd.
8. 12 in.
9. 1656 sq. in.
10. 78 in.

Page 62.

3. 1061
5. 3989
a. 5050

Page 63.

3. Prime. 127 and 257 Composite. 249 and 371

Page 66.

7. 240
8. 300

* Pupils will understand this equation if they think of it as finding one twelfth of — 324. $\frac{1}{12}$ of $-324 = -27$.

9. 300
10. 120
11. 120
12. 600
13. 144
14. 1400

Page 67.

1. 5
2. 19
3. 16
4. 54
5. 30
6. $7b$
7. $24c$
8. $16d$
9. $27x$
10. $60y$

Page 68.

Art. 157.

1. 14
2. 41
3. 22

Page 69.

1. { 2 rt. ang. or 180°
2. { 1 rt. ang. or 90°
3. 90°, 50°
5. 60°
6. No.
7. 65°, 65°

Page 70.

Art. 159.

1. 90°, 58°
2. 80°
3. 105°
4. 32, 48, etc.
5. 48, 96, 144
6. 48
7. 551
8. 2, 2, 11, 19
   a $2 \times 2 \times 11$
9. b 2×2
   c 2

Art. 160.

1. 180
2. 143
3. 96
4. 304
5. 1978
6. 72
7. 405
8. 1320
9. 9945
10. 1155
   a 15598

Page 71.

4. Ten is exactly divisible by $2\frac{1}{2}$; so is any number of 10's plus any number of times $2\frac{1}{2}$.
5. All.
7. All except 742

Page 72.

1. $(4 \times 58) + 1$
2. $(4 \times 37) + 2$
3. $(4 \times 46) + 3$
4. 4×468
5. $(3 \times 78) + 2$
6. $(3 \times 54) + 1$
7. 3×864
8. $(2 \times 388) + 1$
9. 2×126
10. $(5 \times 864) + 3$

Page 74.

Art. 164.

1. $(4 \times 24) + 2$
2. $(4 \times 37) + 3$
3. $(3 \times 46) + 2$
4. $(3 \times 34) + 1$
5. $(8 \times 47) + 3$
6. $(8 \times 36) + 5$
7. $(6 \times 25) + 2$
8. $(6 \times 45) + 3$

Page 75.

3. 20
4. 12
5. 32

Page 76.

1. 20
2. 5
3. 48
4. 288
5. 25
6. 90
7. 20
8. 25
9. 130

10. 150
a 801

Page 78.

1. 8
2. 2
3. 5
4. 22
5. 18
6. 5
7. 6
8. 7
9. 11
10. 13
a 97

Page 80.

1. 120°
2. 62°
3. 50°
4. Rectangular.
5. $360°-(a+b+c)$
6. 30°, 60°, 90°
7. Exactly divisible by each; by 18 because it is exactly divisible by 9 and by 2; by 15 because it is exactly divisible by 3 and by 5, etc.
8. By all except 26 and 8.

Page 84.

1. $\frac{11}{15}$
2. $\frac{4}{5}$
3. $\frac{26}{45}$
4. $\frac{47}{68}$
5. $\frac{4}{15}$
6. $\frac{1}{5}$
7. $\frac{19}{45}$
8. $\frac{21}{68}$
9. $\frac{3}{8}$
10. $\frac{5}{8}$
a 5*

Page 85.

1. 100 160ths.
2. 110 "
3. 72 "
4. 148 "
5. 12 "
6. 60 160ths.
7. 50 "
8. 88 "
9. 74 "
10. 86 "
a 5

Page 86.

1. $\frac{44}{60}, \frac{27}{60}$
2. $\frac{76}{100}, \frac{65}{100}$
3. $\frac{92}{120}, \frac{51}{120}$
4. $\frac{63}{315}, \frac{25}{315}$
5. $\frac{32}{180}, \frac{111}{180}$
6. $\frac{16}{60}, \frac{24}{60}, \frac{33}{60}$
7. $\frac{24}{100}, \frac{20}{100}, \frac{35}{100}$
8. $\frac{28}{120}, \frac{48}{120}, \frac{69}{120}$
9. $\frac{504}{630}, \frac{441}{630}, \frac{580}{630}$
10. $\frac{148}{180}, \frac{54}{180}, \frac{69}{180}$
a 12†

Page 87.

4. $\frac{b}{ac}$
5. $\frac{x^2y}{z^2}$
6. $\frac{1}{a^3b^2}$

* The sum may easily be found by first combining the fractions having the same denominators. Or, if the teacher desires to make the problem more difficult, she may direct the pupil to first find the sum of the 1st, 2nd, 3rd, 5th, 6th, and 7th; then of the 4th, 8th, 9th, and 10th.

† First add the fractions by line; that is, find the sum of the fractions in (1) and (6); then the sum of (2) and (7). Then find the sum of the five sums. Or, without reducing, combine all fractions that have the same denominators.

7. $\frac{1}{x^2y^3}$

8. $\frac{2a+2b}{3c+4d}$

9. $\frac{bc}{x}$

10. $\frac{1}{2a}$

11. $\frac{x+2y}{4}$

Page 88.

Art. 183.

2. $\frac{4c^3}{ab^2c^2}$, $\frac{3ab}{ab^2c^2}$

3. $\frac{axy}{5a}$, $\frac{5yz}{5a}$

Page 90.

1. $617\frac{101}{120}$
2. $a+b$
3. \$49; \$147
4. 23; 46; 92
5. \$55; \$85
6. 2, 3, 5, 6, 10, 15
7. a, b, c, ab, bc, ac
8. $\frac{37\frac{1}{2}}{60}$; more.
9. $\frac{37\frac{1}{2}}{100}$; $\frac{66\frac{2}{3}}{100}$
10. .16$\frac{2}{3}$; .83$\frac{1}{3}$

Page 91.

Art. 179.

1. $\frac{53}{80}$
2. $\frac{23}{30}$
3. $\frac{59}{84}$
4. $\frac{34}{45}$
5. $1\frac{2}{36}$
6. $1\frac{67}{80}$
7. $1\frac{17}{30}$
8. $1\frac{23}{42}$
9. $1\frac{41}{45}$
10. $1\frac{27}{140}$

a 12*.

Art. 186.

1. $\frac{29}{90}$
2. $\frac{1}{90}$
3. $\frac{7}{60}$
4. $\frac{23}{60}$
5. $\frac{1}{18}$
6. $\frac{1}{9}$

b 1

Page 92.

Art. 187, I.

1. $7\frac{31}{36}$
2. $14\frac{1}{8}$
3. $27\frac{27}{280}$
4. $21\frac{1}{40}$
5. $28\frac{39}{40}$
6. $8\frac{3}{4}$
7. $13\frac{29}{36}$
8. $27\frac{569}{140}$
9. $42\frac{3}{4}$
10. $7\frac{1}{4}$

a 200

Art. 187, II.

1. $3\frac{3}{4}$
2. $7\frac{19}{40}$
3. $4\frac{7}{20}$
4. $9\frac{21}{40}$
5. $8\frac{9}{20}$
6. 4
7. $3\frac{13}{40}$
8. $19\frac{1}{8}$

b 60

Page 93.

Art. 188, I.

1. $1\frac{2}{3}$
2. $3\frac{1}{6}$
3. $2\frac{3}{4}$
4. $3\frac{29}{30}$
5. 10
6. $5\frac{2}{5}$
7. 6
8. $3\frac{3}{5}$
9. $2\frac{1}{3}$
10. $2\frac{4}{5}$
11. $2\frac{1}{4}$
12. $3\frac{1}{30}$

a 47

Art. 188, II.

1. $24\frac{1}{2}$

* To find the sum of the ten sums, first add by line; that is, find the sum of Nos. 1 and 6 and reduce to its simplest form: then the sum of Nos. 2 and 7, etc.

2. $32\frac{1}{4}$
3. $29\frac{3}{5}$
4. 18.5
5. 22
6. $7\frac{1}{2}$
7. 28
8. $32\frac{1}{2}$
9. 31.5
10. $10\frac{3}{5}$
11. $27\frac{3}{4}$
12. $45\frac{1}{2}$

b 310

Page 94.

Art. 189, I.

1. $\frac{7}{48}$
2. $\frac{7}{60}$
3. $\frac{7}{240}$
4. $\frac{5}{24}$
5. $\frac{5}{30}$
6. $\frac{5}{120}$
7. $\frac{17}{96}$
8. $\frac{17}{120}$
9. $\frac{17}{480}$*

a $1\frac{1}{16}$

Art. 189, II.

1. $5\frac{11}{15}$
2. $4\frac{3}{10}$
3. $2\frac{13}{15}$
4. $6\frac{1}{10}$
5. $4\frac{23}{40}$
6. $3\frac{1}{20}$
7. $5\frac{1}{2}$
8. $4\frac{1}{8}$
9. $2\frac{3}{4}$

b 39†

Page 96.

Art. 190, I.

1. $172\frac{1}{2}$
2. 103.5
3. 69
4. $87\frac{2}{3}$
5. $197\frac{1}{4}$
6. $175\frac{1}{3}$
7. $65\frac{3}{4}$
8. 216
9. 432

a 1519‡

Art. 190, II.

1. $\frac{7}{32}$
2. $\frac{21}{160}$
3. $\frac{7}{80}$
4. $\frac{5}{24}$
5. $\frac{15}{32}$
6. $\frac{5}{12}$
7. $\frac{5}{32}$
8. $\frac{3}{16}$
9. $\frac{3}{8}$

b $2\frac{1}{4}$

Art. 190, III.

1. $186\frac{1}{8}$
2. $111\frac{27}{40}$
3. $74\frac{9}{20}$
4. $174\frac{5}{9}$
5. $392\frac{3}{4}$
6. $349\frac{1}{9}$
7. $130\frac{11}{12}$
8. $57\frac{9}{16}$
9. $115\frac{1}{8}$

c $1592\frac{13}{48}$

Art. 190, IV.℁

1. $971\frac{3}{5}$

* All the fractions may be changed to 480ths. Why is the sum of the nine sums exactly one half of $(\frac{7}{12} + \frac{5}{6} + \frac{17}{24})$?

† Why is the sum of the nine sums exactly three fourths of the sum $17\frac{1}{5}$, $18\frac{3}{10}$, and $16\frac{1}{2}$?

‡ Why is the sum of the nine products equal to 345 + (2 times 263) + $1\frac{1}{8}$ times 576?

℁ Do not solve these problems by reducing the numbers to improper fractions. Much of seeming difficulty will disappear if the pupil clearly understands what it means to multiply by a mixed number. To multiply $462\frac{2}{3}$ by $2\frac{1}{10}$, take two times $462\frac{2}{3}$ and to the product add $\frac{1}{10}$ of $462\frac{2}{3}$. To multiply $462\frac{2}{3}$ by $3\frac{7}{10}$, take three times $462\frac{2}{3}$ and to the product add $\frac{7}{10}$ of $462\frac{2}{3}$.

2. $1711\frac{13}{16}$
3. $1017\frac{13}{16}$
4. $807\frac{13}{16}$
5. $1298\frac{1}{8}$
6. $1269\frac{5}{16}$
7. $778\frac{7}{8}$
8. $1239\frac{3}{4}$
9. $895\frac{3}{8}$
10. $619\frac{7}{8}$

d $10610\frac{1}{3}$

Page 97.

1. $\frac{29}{36}$
3. $\frac{9}{36}$
4. $\frac{11}{36}$

Page 98.

Art. 192, I.

1. $\frac{a^2c}{b^3}$
2. $\frac{x^2}{y^3}$
3. $\frac{xy}{y^2} = \frac{x}{y}$
4. $\frac{a^2b}{cd}$
5. $\frac{3a^2x}{bx}$
6. $\frac{5x}{7}$

Art. 192, II.

1. $\frac{a^2}{b^2c}$
2. $\frac{x}{xy^3} = \frac{1}{y^3}$
3. $\frac{x}{y^3}$
4. $\frac{b}{cd}$
5. $\frac{x}{3bx}$
6. $\frac{x}{35}$

Page 100.

1. $138\frac{9}{11}$ rd.
2. $61\frac{11}{16}$ ft.
3. 45 rd.; 135 rd.
4. $\$4397\frac{3}{4}$
5. \$5.40; $\frac{2}{3}$
6. $\frac{12\frac{1}{2}}{30}$
7. $\frac{25\frac{1}{2}}{30}$
8. $\frac{a^2c}{bc}$
9. $5\frac{5}{24}$
10. $15\frac{1}{32}$
11. \$1800
12. \$360

Page 102.

Art. 195, I.

1. 92
2. $61\frac{1}{3}$
3. $76\frac{2}{3}$
4. 750
5. 500
6. 625
7. 392
8. $261\frac{1}{3}$
9. $326\frac{2}{3}$

a 3085 *

Art. 195, II.

1. $1\frac{5}{16}$
2. $1\frac{1}{20}$
3. $1\frac{1}{80}$
4. $\frac{5}{8}$
5. $\frac{1}{2}$
6. $\frac{13}{24}$
7. $\frac{11}{16}$
8. $\frac{11}{20}$
9. $\frac{14}{24}$

b 7†

Art. 195, III.

1. $7\frac{1}{3}$
2. $6\frac{5}{12}$
3. $13\frac{3}{4}$
4. $32\frac{8}{9}$
5. $28\frac{7}{9}$
6. $61\frac{2}{3}$
7. $26\frac{4}{9}$
8. $23\frac{5}{36}$
9. $49\frac{7}{12}$

c 250.‡

* Observe that the sum of the first three quotients is exactly 5 times 46; of the second three, 5 times 375; of the third three, 5 times 196. Why?

† The sum of the first three quotients is exactly 4 times $\frac{7}{8}$. Why?

‡ The sum of the first three quotients is exactly 5 times $5\frac{1}{2}$. Why?

Art. 195, IV.

1. $130\frac{1}{6}$
2. $135\frac{5}{8}$
3. $97\frac{13}{20}$
4. $43\frac{2}{5}$
5. $244\frac{1}{8}$
6. $69\frac{4}{6}$
7. $72\frac{17}{24}$
8. $52\frac{7}{20}$
9. $23\frac{4}{15}$
10. $130\frac{7}{8}$

d 1000 *

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Art. 196, I.

1. $1\frac{2}{3}$
2. $1\frac{1}{5}$
3. $1\frac{7}{18}$
4. $4\frac{1}{6}$

a $8\frac{1}{3}$

Art. 196, II.

1. $\frac{1}{6}$
2. $\frac{1}{12}$
3. 10
4. $\frac{3}{4}$

b 11

Art. 196, III.

1. 16
2. $10\frac{2}{3}$
3. $13\frac{1}{3}$
4. 40

c 80

Art. 196, IV.

1. $\frac{1}{8}$
2. $\frac{1}{6}$
3. $\frac{2}{3}$
4. $\frac{7}{8}$

Page 104.

1. $\frac{11}{15}$
2. $\frac{4}{5}$
3. $\frac{100}{160}$
4. $\frac{110}{160}$
5. $\frac{53}{80}$ T.
6. $1\frac{67}{80}$ A.
7. $\frac{7}{640}$ mi.
8. $\frac{23}{60}$
9. $21\frac{1}{40}$ T.
10. $28\frac{39}{40}$

Page 105.

11. $1\frac{2}{3}$ hr.
12. 10 yd.
13. $\$24\frac{1}{2}$
14. 22 mi.
15. $\frac{7}{48}$ yd.
16. $\frac{5}{24}$ hr.
17. $5\frac{11}{15}$ mi.
18. $4\frac{23}{40}$ A.
19. $\$172\frac{1}{2}$
20. $\$197\frac{1}{4}$
21. $\frac{7}{320}$ sq. mi.
22. $\$\frac{3}{8}$

Page 106.

23. $186\frac{1}{8}$ sq. rd.
24. $\$115\frac{1}{8}$
25. $\$1156\frac{2}{3}$
26. $1239\frac{3}{4}$ sq. ft.
27. 92 bu.
28. 500 bu.
29. $1\frac{5}{16}$ yd.
30. $\frac{1}{2}$ yd.
31. $7\frac{1}{3}$ ft.
32. $61\frac{2}{3}$ bu.
33. $130\frac{1}{8}$ rd.
34. $\frac{1}{6}$

Page 107.

Art. 198, I.

1. $\frac{bx}{a}$
2. $\frac{dy}{c}$
3. $\frac{ax}{b}$
4. $\frac{by}{c}$
5. axy
6. $\frac{ayz}{2}$

Art. 198, II.

1. $\frac{ay}{bx}$
2. $\frac{by}{cx}$
3. $\frac{cz}{dy}$
4. $\frac{ax}{bz}$

* The sum of the first five quotients is exactly 2 times $325\frac{1}{3}$. W

5. $\frac{by}{cx}$

6. $\frac{cy}{dx}$

Page 108.

Art. 199, I.

1. $\frac{xy + a}{y}$

2. $\frac{xy + 2}{x}$

3. $\frac{2b + x}{2}$

4. $\frac{cx + a}{x}$

5. $\frac{3x + 2}{x}$

6. $\frac{3x + 2}{3}$

Art. 199, II.

1. $a + \frac{b}{x}$

2. $b + \frac{c}{y}$

3. $b + \frac{2}{y}$

4. $y + \frac{a}{3}$

5. $b + \frac{c}{2a}$

6. $a + \frac{d}{bc}$

Art. 199, III.

1. $\frac{ay}{bx}$

2. $\frac{2b}{3a}$

3. $\frac{cx}{by}$

4. $\frac{2x}{3y}$

Page 109.

1. 90°
2. 80°
3. 180°

Page 110.

1. \$162
2. \$98.56
3. $\frac{19}{60}$
4. $\frac{61}{91}$
5. $\frac{5}{9}$
6. 28 da.
7. $158\frac{1}{8}$ lb.
8. $9\frac{3}{10}$ lb.
9. $\frac{7}{8}$
10. Yes.
11. Yes.
12. $\frac{20}{46}$
13. $\frac{6}{15}$

Page 111.

"Example 1."

1. $\frac{9}{20}$
2. $\frac{9}{800}$
3. $\frac{3}{8}$
4. $\frac{3}{80}$
5. $\frac{11}{80}$
6. $\frac{11}{800}$
7. $\frac{5}{8}$
8. $\frac{5}{80}$

a 2.2

b $2\frac{1}{5}$

"Example II."

1. .75
2. .075
3. .6
4. .06
5. .25
6. .925
7. .4
8. .94

c 4

Page 112.

"Example III."

1. .428 +
2. .714 +
3. .857 +
4. .181 +
5. .272 +
6. .545 +
7. .166 +
8. .833 +
9. .444 +
10. .555 +
11. .666 +

12. .333 +
a 6*
b 5.994 +†

Page 113.

1. $\frac{2}{6}\frac{3}{0}$
2. $\frac{4}{6}\frac{2}{0}\frac{2}{0}$
3. $\frac{3}{7}\frac{1}{0}\frac{7}{0}$
4. $\frac{1}{6}\frac{3}{5}\frac{3}{0}$
5. $\frac{9}{2}\frac{7}{7}\frac{7}{5}$
6. $\frac{2}{5}\frac{2}{5}\frac{3}{0}$
7. $\frac{3}{6}\frac{7}{0}$
8. $\frac{1}{6}\frac{0}{0}\frac{1}{0}$
9. $\frac{3}{7}\frac{8}{0}\frac{3}{0}$

a 4 †
b 4

Page 114.

Art. 204, I.

1. .50
2. $.33\frac{1}{3}$
3. $.12\frac{1}{2}$
4. .30
5. $14\frac{2}{7}$.
6. .25
7. $.16\frac{2}{3}$
8. $.37\frac{1}{2}$
9. .40
10. $.28\frac{4}{7}$
11. .10
12. $.66\frac{2}{3}$
13. $.27\frac{1}{2}$
14. .28
15. $.21\frac{3}{7}$
16. .15
17. $.83\frac{1}{3}$
18. $.22\frac{1}{2}$
19. .02
20. $.35\frac{5}{7}$

a 6‡
b 6

Art. 204, II.

1. $.06\frac{2}{7}$
2. $.08\frac{4}{7}$
3. $.09\frac{5}{7}$
4. $.10\frac{2}{7}$
5. .12
6. .20
7. $.13\frac{5}{7}$
8. $.09\frac{1}{7}$
9. $.10\frac{2}{7}$

a 1
b 1

Page 115.

Art. 204, III.

1. $.07\frac{2}{5}$
2. $.09\frac{1}{5}$
3. $.18\frac{4}{5}$
4. $.64\frac{3}{5}$
5. $.11\frac{1}{4}$
6. .23
7. .30
8. $.35\frac{3}{4}$
9. .12
10. $.13\frac{1}{3}$
11. $.28\frac{1}{3}$
12. $.46\frac{1}{3}$

a 3.§
b 3.

Art. 204, IV.

1. .35
2. .56
3. .54
4. .64
5. .70
6. .36
7. .65
8. .44
9. .46

a 4.7

Art. 204, V.

1. .46
2. .46

* Why *must* the difference between *a* and *b* be less than 12 th sandths.

† First add those that have the same denominator; then th that can easily be changed to fractions having a common deno nator.

‡ Add by line; that is, first find the sum of Nos. 1, 6, 11, 16; th of Nos. 2, 7, 12, 17, etc.

§ Add by column.

3. .44
4. .15
5. .45
6. .40
7. .54
8. .54
9. .56

a 4

Page 116.

1. $\frac{1}{24}$
2. $\frac{5}{24}$
3. $\frac{11}{24}$
4. $\frac{1}{33}$
5. $\frac{7}{33}$
6. $\frac{7}{11}$
7. $\frac{1}{6}$
8. $\frac{3}{10}$
9. $\frac{9}{16}$
10. $\frac{3}{16}$
11. $\frac{5}{8}$
12. $\frac{2}{4}$
13. $\frac{7}{8}$
14. $\frac{15}{32}$
15. $\frac{5}{64}$
16. $\frac{3}{10}$
17. $\frac{9}{40}$
18. $\frac{5}{16}$
19. $\frac{15}{32}$
20. $\frac{9}{32}$
21. $\frac{5}{8}$
22. $\frac{1}{4}$
23. $\frac{7}{16}$
24. $\frac{25}{32}$
25. $\frac{1}{8}$
26. $\frac{1}{18}$
27. $\frac{3}{16}$

Page 117.

1. 15
2. 36
3. 12
4. 30

Page 118.

1. 55; 220
2. $36; $180
3. 90; 360
4. 44; 52
5. 28; 65
6. 35

Page 119.

1. 90°
3. Yes.
4. No.
6. No.

Page 120.

1. .60; .12½, etc.
2. $\frac{4}{25}$; .16
3. $\frac{1}{50}$; .02
4. $\frac{3}{20}$; .15
5. $\frac{1}{18}$; .61$\frac{1}{9}$; .611$\frac{1}{9}$; .6111$\frac{1}{9}$
6. $\frac{1}{3}$; .33$\frac{1}{3}$; .333$\frac{1}{3}$; .3333$\frac{1}{3}$
7. $\frac{1}{2}$; .50; .500; .5000
8. .08

Page 122.

1. 1091.40
   892.84
   5.338
2. 2247.
   1838.2
   10.99
3. 2760.6
   2258.36
   13.502
4. 1605.
   1313.
   7.85
5. 3210.
   2626.
   15.70
6. 898.8
   735.28
   4.396
7. 1027.2
   840.32
   5.024
8. 2247.
   1838.2
   10.99
9. 4173.
   3413.8
   20.41

a 35110.2

10. $257.52
11. $352.50
    $22.50

Page 123.

1. 2400

2. 1440
3. 720
4. 480
5. 900
6. 12000
7. 18000
a 35940

Page 124.

1. $264
2. $228.80
3. $137.28
4. $102.96
5. $68.64
6. $342.00
7. $541.50
8. $324.90
9. $270.75
10. $259.92
a $2540.75
11. $275.50
$242.44
12. $1240.
$1165.60
13. $372.50
$22.35

Page 125.

1. $31\frac{1}{4}\%$
2. $46\frac{7}{8}\%$
3. $59\frac{3}{8}\%$
4. $43\frac{3}{4}\%$
5. $18\frac{3}{4}\%$
a 200%*

Page 126.

1. $5\frac{1}{3}\%$
2. 9%
3. $12\frac{1}{2}\%$
4. $15\frac{5}{6}\%$
5. $57\frac{1}{3}\%$
6. $6\frac{2}{3}\%$
7. 12%
8. $11\frac{1}{3}\%$
9. $10\frac{2}{3}\%$
10. $59\frac{1}{3}\%$
11. $12\frac{4}{13}\%$
12. $15\frac{5}{13}$
13. $19\frac{1}{13}\%$
14. 24%
15. $29\frac{3}{13}\%$
a 100%
b 100%
c 100%
16. 2%
17. 4%
18. 5%
19. 7%
20. 20%
21. 15%
22. 12%
23. 12%
24. 6%
25. $6\frac{1}{4}\%$

Page 127.

1. 100
2. 30 yr.
3. 45; 27
4. 45; 30
5. 75; 45

Page 128.

1. 40; 28
2. 50¢; 37¢
3. 60
4. 80
5. 12

Page 129.

2. $b = 70°$
$c = 70°$
$d = 110°$
4. 55°

Page 130.

1. 12%
2. $41\frac{2}{3}$
3. $270
4. 85%
5. $81.25
6. $164
7. 49%
8. $90
9. 75; 45
10. 80°; 100°; 100°
11. 20%

Page 131.

1. $33\frac{1}{3}\%$
2. 25%
3. 20%

* How does it happen that the sum of these results is exactly 200%

4. $16\frac{2}{3}$
5. $12\frac{1}{2}\%$
6. $11\frac{1}{9}\%$
7. $\left\{\begin{matrix}20\% \\ 16\frac{2}{3}\%\end{matrix}\right.$

Page 132.

1. 20% gain.
2. 8% loss.
3. 8% gain.
4. 16% loss.
5. 20% gain.
6. $12\frac{1}{2}\%$ loss.
7. 30% gain.
8. 10% loss.
9. 30% gain.
10. 10% loss.
11. $16\frac{2}{3}\%$ loss.
12. $16\frac{2}{3}\%$ gain.
13. 25% gain.
14. 20% loss.
15. 25% loss.
16. 33% gain.
17. $56\frac{1}{4}\%$; \$8.80; $45\frac{5}{6}\%$
18. $33\frac{1}{3}\%$
19. $6\frac{1}{4}\%$ lost.

Page 133.

1. 623.
   483.
   945.35
2. 551.80
   427.80
   837.31
3. 516.20
   400.20
   783.29
4. 445.
   345.
   675.25
5. 712.
   552.
   1080.40
6. 534.
   414.
   810.30
7. 890.
   690.
   1350.50

a 14066.4

8. \$360
9. \$585
10. \$12000
    \$28000

Page 134.

1. \$34.80
2. \$43.40
3. \$24.25
4. \$23.68
5. \$25.60

a \$151.73

Page 135.

1. 250%
2. 125%
3. 160%
4. 140%
5. 325%

a 1000*

6. 205%
7. 276 + %
   36 + %

Page 136.

1. 3.16
   1.78
   1.36
2. 1.58
   .89
   .68
3. 1.58
   .89
   .68

a 12.60†

4. 17.36
   18.62
   25.20
5. 23.56

* Since the sum of these results is 1000, how many times 845 is the sum of the last numbers given in the five problems? Find the sum of 2112.5, 1056.25, 1352, 1183, 2746.25, and compare it with 845.

† How does it happen that this sum equals 1% of the sum of 632, 356, and 272?

25.27
34.20
6. 8.68
9.31
12.60
b 174.8 *
7. $\frac{11}{16}$; $11\frac{3}{4}\frac{3}{7}\%$
8. $\frac{1}{4}\frac{8}{7}$; $38\frac{1}{4}\frac{4}{7}\%$
9. $\frac{1}{2}$; 50%
c 100% †
10. 500
375
300
11. 800
600
480
12. 1400
1050
840
d 6345
13. 300
14. 400
15. 520
e 1220
16. 640
17. 436
18. 300
f 1376

Page 137.

2. 55; 64
3. $\frac{3}{1}\frac{3}{0}$; $\frac{3}{5}$
5. 416
743

Page 138.

2. 42; 33.6
4. $110
$36

Page 139.

1. 5 △'s
2. 2 rt. L
10 rt. L
3. 4 rt. L

Page 140.

1. 50% gain.
2. $33\frac{1}{3}\%$ loss.
3. 25% gain.
4. 20% loss.
5. 20% gain.
6. $16\frac{2}{3}\%$ loss.
7. 25% g.; 50% g.
8. 75% gain.
100% gain.
9. 125% gain.
150% gain.
10. 50% loss; 75% loss.
11. $4.92
12. $8.20
13. 20% ‡
14. $4\frac{1}{8}\%$
15. Less.
16. $55

Page 141.

1. $6.48
2. $2.76
3. $10.69
4. $32.19
5. $22.47
a $2055.62
b $74.59
c $1981.03

Page 142.

1. $15.75
2. $12.60
3. $21.06
4. $36.86
5. 94¢
6. 91¢
a $88.12
7. $24.30, $23.40
8. 60 off.
9. 50% §
10. $33\frac{1}{3}\%$ gain.

* Observe that this sum is exactly 10% of the sum of 496, 532, and 720.

† Observe that 11 + 36 + 47 = 94; hence the sum of the "per-cents" must equal 100.

‡ $156 is 80% of the cost; then the horse cost $195.

§ If the list price was $1.00 the cost would be 60¢, and the selling price 90¢.

Page 143.

1. $110
   $110
   $165
2. $140
   $84
3. $212.50
4. $5500
   $5225
5. $409.69

Page 144.

1. $264.*
2. $4317.93
3. $51
4. 4%
   $9310
5. $1424

Page 145.

1. $100
2. $4750
   $5000
3. $35; $105
5. $8000
   $4800

Page 146.

1. 35%
2. $8.80
3. $50
4. $2175 †
5. $20000
6. 2⅔%; 97⅓%
7. $96
8. 33⅓%
9. 25%
10. $139.29

Page 147.

1. 224 girls.
   672 boys.
2. 80 sheep.
   95 "
   60 "
3. 160 A.
   80 "
   320 "
4. 97 pear.
   199 apple.
5. 90
6. 18
7. 60
8. 168

Page 148.

1. 10 yr.
2. 36, 37, 38, 39
3. 28, 29, 30
4. 144; 216
5. 72; 96
6. 58; 145
7. $65
8. $110
9. $50
10. 620
11. 560

Page 149.

1. 6 △'s
2. 2 rt. L's
   12 " "
3. 4 " "

Page 150.

1. $15
   a ¼; 25%
   b ⅕; 20%
   c ⅘; 80%
2. 50%
3. 33⅓%
4. 50%
5. 33⅓%
6. $6636.87
7. 35 off.
8. More.
9. Either.

Page 151.

1. $50.82
2. $45.00
3. $7.30
4. $41.10
5. $60.00
6. $181.44
   a $385.66

Page 152.

1. $34.17
2. $71.46
3. $29.92
4. $12.70

* The taxes must be computed on the assessed value.

† The total loss was $7675; of this the insurance company paid $5500.

5. $41.94
a $190.19

Page 153.

1. $51.21
2. $18.73
3. $27.94
4. $45.04
a $142.92

Page 155.

1. $20.45
2. $51.32
3. 51.91
4. $84.45
5. $13.87
a $222.00
6. $9.44
7. $6.62
8. $10.31
9. $6.47
10. $9.46
b $42.30
11. $64.14
12. $34.21
13. $64.32
14. $96.93
15. $29.13
c $288.73
16. $1037.24
17. $381.06
18. $524.50
19. $718.80
20. $959.89
d $3621.49

Page 156.*

1. 3 yr. 5 mo. 25 da.
   3 " 5 " 26 "
2. 3 " 6 mo. 5 "
   3 " 6 " 5 "
3. 3 " 3 " 9 "
   3 " 3 " 10 "
4. 3 " 4 " 9 "
   3 " 4 " 9 "
5. 3 " 8 " 3 "
   3 " 8 " 1 "
6. 3 " 10 " 3 "
   3 " 10 " 3 "
7. 6 " 0 " 15 "
   6 " 0 " 15 "
8. 6 " 11 " 15 "
   6 " 11 " 15 "
9. 5 " 4 "
   5 " 4 "

Page 157.

1. 2800
2. 900
3. 500
4. 925
5. 662.5
7. $135.50
8. $860
9. 360 sheep.

Page 158.

1. 90%
2. 5%
3. 35%
4. 15%
5. 12%

Page 159.

1. 360°
2. 360°
3. 360°

Page 160.

1. $20.50
2. $369.58
3. $519.31
4. $644.70
5. $803.20
6. $392
7. $395.92†

* Observe that the two answers to each problem are alike when the number denoting the day of the month in the later date is equal to, or greater than, the number denoting the day of the month in the earlier date. They are alike, too, when the month next before the last one named is a 30-day month. Why?

† Answer to question in *Note.*—$4.08 saved at the end of the two-month period.

8. $20.29
9. $84.30 *
10. 12 rt. L's

Page 162.

1. $373.13
2. $444.75
3. $2259.75
4. $4941.67
5. $3472

Page 163.

1. $549.31
2. $330.85

Page 164.

1. $438.17 †

Page 166.

1. $516.71
2. $127.56
3. $534.48
4. (1) $529.29
   (2) $132.37
   (3) $540.32
   $1201.98

Page 167.

1. $450
2. $340
3. $500
4. $750
5. $640
6. $400
a $3080

Page 168.

1. $320
2. $530
3. $350
4. $250
5. $400
a $1850

Page 169.

1. 486 sq. in.
2. 180 sq. yd.
3. 9.2 acres.
4. 24 sq. rd.
5. 9 times.

Page 170.

1. $994.17
2. May 10th.
   $1000
   7+ %‡
3. $199.65
4. $173.059
5. $75
6. $75
7. 480 sq. ft.

Page 172.

1. $\frac{1}{10}$
2. $15000
   $300
3. $54000
4. $3000

Page 173.

(a) $40; $24; $48; $8
(b) $400
(c) $550
(d) $15; $9; $18; $3
(e) $150
(f) $1980
(g) $1150

Page 174.

(h) $500; $50; $220; $230
(i) $435; $1914; $2001
(j) X, No.
   Y, No.
   Z, Yes.
   A, Yes.
   B, No.
   M, No.
1. 5%; $75
2. $2250
   $18
3. 5½%

* Answer to questions in *Note:* $\frac{2}{3}$; 1½.

† Time on last payment is 2 mo. 17 da.

‡ He pays for the use of $994.17, what at 7% he would pay for the use of $1000.

Page 175.

1. $50
2. $70
3. $51000
   $3006
   $90

Page 176.

1. 4 *
2. Jan. 1, 1899
   Jan. 1, 1900
   Jan. 1, 1901
   Jan. 1, 1902
3. $5
4. $250

Page 177.

1. 8%
2. 5%
3. 6%
4. 5%
5. 8%

Page 178.

1. $1\frac{1}{2}$ yr.
2. $2\frac{2}{3}$ yr.
3. $1\frac{5}{12}$ yr.
4. $1\frac{3}{15}$ yr.
5. $1\frac{5}{24}$ yr.
6. $520
7. $360
8. 4%
9. $2\frac{2}{3}$ yr.

Page 179.

Problem: $\frac{9}{10}$ A.

Page 180.

1. $1320
   $45
2. $156
3. 19 or 20
   $25
4. $20450
5. $15000
6. $18000
7. $60
8. 3 A.
9. 3 A.

Page 182.

Exercise III.

1. 3
2. 18
3. 11
4. 12
5. $2\frac{1}{2}$

Page 183.

Exercise IV.

1. $\frac{3}{4}$
2. $\frac{7}{9}$
3. $\frac{17}{35}$
4. $\frac{1}{24}$
5. $\frac{5}{22}$

Exercise V.

1. 8
2. 15
3. 16
4. 4
5. 7

Exercise VI.

1. $\frac{2}{3}$
2. $1\frac{3}{5}$
3. $\frac{5}{17}$
4. $\frac{1}{16}$

Page 184.

Exercise VII.

1. .75
2. .4
3. .375
4. .25
5. .3

Exercise VIII.

1. .75
2. .07
3. .68
4. .48
5. $.05\frac{2}{5}$

Exercise IX.

1. $\frac{2}{5}$; $2\frac{1}{2}$
2. $\frac{2}{3}$; $1\frac{1}{2}$

Page 185.

Exercise X.

1. $\frac{6}{25}$; .24; .24
2. $2\frac{7}{15}$; $2\frac{7}{15}$
3. $\frac{19}{20}$; .95; .95

* It is stated in the Bond that the interest is payable annually and that the last year's interest is payable with the Bond; hence only 4 coupons are required.

Miscellaneous.

1. 10
2. 10
3. $\frac{3}{50}$
4. 10; 10; 10
5. 10; 10
6. $5\frac{1}{2}$; 3; 12

Page 186.

1. $\frac{1}{3}$; 9
2. $\frac{1}{3}$; 3
3. $\frac{1}{4}$; 4
4. $\frac{1}{2}$; 2
5. $\frac{1}{27}$; 27
6. $\frac{1}{3}$; 4
7. $\frac{1}{8}$; 8
8. $\frac{1}{4}$; 4
9. $\frac{1}{144}$; $17\frac{1}{25}$

Page 187.

Example I.

1. 825
2. 69
3. .112

Example II.

1. 15
2. 128
3. $1\frac{1}{15}$
4. $.41\frac{2}{3}$

Page 188.

1. 49; 147
2. 84; 210
3. .12; .30

Page 189.

Problem: $\frac{9}{20}$ A.

Page 190.

1. 168.75 lb.
2. .7
3. 1206.25 lb.
4. 2
5. 7.8
6. 10; 10; 10
7. 4; 8
8. $2\frac{1}{2}$; $\frac{2}{5}$
9. 256 sq. in.
10. No.
11. 16
12. Equal.

Page 191.

1. 360
2. 600
3. 350
4. 75
5. 105
6. 630

Page 192.

Example II.

1. 43
2. $7\frac{1}{2}$
3. 50
4. 360
5. 63
6. 7

Example III.

1. 18
2. 15
3. 20
4. 54
5. 75
6. 5

Example IV.

1. 48
2. 88
3. 88
4. 24
5. 30
6. 81

Page 193.

1. $23.05
2. $457.20
3. $10\frac{1}{2}$ T.
4. 90 lb.
5. $\$3\frac{1}{2}$
6. 30 ft.
7. 95 ft.
8. 75 mi.
9. 4 mi.

Page 194.

1. 9 to 16
2. 4 t's
3. $6\frac{3}{4}$ oz.
4. 68 cookies.
5. 4000 lb.

Page 195.

1. 27 to 64
2. 8 times.
3. $33\frac{3}{4}$ lb.
4. 160 loaves.
5. $1\frac{2}{3}\frac{5}{3}$ lb.

Page 196.

1. 16 da.
2. 32 da.
3. $\frac{9}{16}$; $\frac{1}{4}$

Page 198.

1. 23
2. 20
3. 100
4. 10
5. 22
6. 5
7. 5
8. 10
9. 20
10. 2
11. $675
12. 4375 lb.
13. 17 cows.

Page 199.

1. 100 sq. in.
2. 5 A.

Page 200.

1. 96 ft.
2. 9 hr.
3. $2000
4. 8 pairs.
5. 90 lb.
6. 16 t's
7. 6 A.
8. $5\frac{2}{5}$ A.
9. $2\frac{5}{8}$ A.

Page 201.

a 2109
b 111

Page 202.

5. 21; 20
6. 24; 18
7. 28; 45
8. 25; 55

a 236

Page 203.

Art. 298.

a $2\frac{3}{36}\frac{7}{0}$
3. $\frac{25}{144}$ sq. ft.

Art. 299.

b $9\frac{13}{16}$
3. $\frac{3}{4}$ ft.
4. $\frac{5}{6}$ yd.
5. $1\frac{7}{9}$ mi.

Page 204.

Art. 300.

a 11.53
3. .81 sq. ft.

Art. 301.

b 8.5
3. 2.2 ft.
4. 2.8 mi.

Page 205.

Art. 302.

1. 1728
   2197
   2744
   3375
   4096
   4913
   5832
   6859
   8000

a 39744

Art. 303.

2. 12
   15
   14
   22
   18

b 81

Page 206.

11. (1) 55
    (2) 65
    (3) 75
    (4) 85
    (5) $\frac{12}{25}$
    (6) $\frac{5}{24}$
    (7) $\frac{7}{18}$
    (8) $\frac{4}{23}$
    (9) .8
    (10) .08
    (11) .25
    (12) 1.6
12. (1) 12
    (2) 25
    (3) 15
    (4) 21
    (5) $\frac{2}{5}$
    (6) $\frac{3}{8}$
    (7) $\frac{4}{7}$
    (8) $\frac{1}{9}$

Page 207.

1. b^2; b^3; b

2. ab; ab^2; a^2b^2
3. $2ab$
   $3a^2b$
   $4ab^2$
4. $5xy$
   $6xy^2$
   $7x^2y^2$
5. (1) 18
   (2) 20
   (3) 75
   (4) 36
   (5) 30
   (6) 90
   a 269
6. (1) 70
   (2) 525
   (3) 2450
   (4) 150
   (5) 588
   (6) 12250
   a 16033

Page 208.

Art. 306.

1. b^2; b; b^3
2. ab; a^2b; a^2b^2
3. $2a^2$; $3b$; $4a^2$
4. (1) 18
   (2) 10
   (3) 9
   (4) 24
   (5) 45
   (6) 180
   a 286

Art. 307.

(1) 251
(2) 1470
(3) 4900
(4) 251
(5) 1470
(6) 7350
(7) 3
(8) 6
(9) 15
b 15716

Page 209.

3. 100 sq. in.
   50 " "
   50 " "
   25 " "
   225 " "
4. 100 sq. in.
   30 " "
   30 " "
   9 " "
   169 " "
5. Square.

Page 210.

1. ab; 15
2. ab; 14
3. ab^2; 45
4. a^2b^2; 225
5. 112 ft.
6. 320 rd.
7. 36 sq. in.
8. 512 cu. in.
9. 300
10. 240
11. 4 t's
12. 4 t's
13. 9 t's

Page 212.

(1) 29.5+
(2) 39.0+
(3) 52.4+
(4) 64.4+
(5) 24.9+
(6) 24.9+
(7) 7.9+
(8) 2.4+
a 245.4+ *

Page 215.

Art. 312.

(1) 83
(2) 29
(3) 268
(4) 43
(5) 27
(6) 246
a 696

* This sum is not "true to tenths"; since had each root been "true to hundredths," there would have been a number to "carry" from hundredths to tenths in the sum.

(7) $\frac{9}{25}$
(8) $\frac{17}{25}$
(9) $\frac{24}{25}$
(10) $\frac{67}{25}$
(11) $\frac{54}{25}$
(12) $\frac{30}{25}$
b $8\frac{1}{25}$
(13) .9
(14) .25
(15) .2
(16) 1.1
(17) .89
(18) .02
c 3.36

Art. 313.

1. 1 or 2
2. 3 or 4
3. 5 or 6
4. 1
5. 2
6. 3

Page 216.

1. 96
2. 12
3. 89
4. 320 rd.
5. 12.64+ rd.
6. 5 in.
7. 112 rd.
8. 30 ft.
9. 160 rd.; 164 rd.
10. 100 sq. ft.*
11. 640 rd.

Page 217.

2. 44 ft.; 22 ft.
3. 480 rd.
4. 432 cu. in. or 864 cu. in.†
5. 100 rd.
6. 32 in.
7. 12

Page 218.

1. 12
2. 20
3. 16
4. 24
5. 25
6. 42
a 139
7. $12000
8. $\frac{4}{5}$
9. 2 : 3
10. 81 : 256
11. 64 : 125

Page 220.

1. 28.2+ ft.
2. 36.0+ ft.
3. 25.7+ ft.
4. $\sqrt{a^2+b^2}$
5. 72+ rd.
1200 sq. rd.
172+ rd.
6. 20 rd.
80 rd.
28.2+ rd.
7. 60 rd.
280 rd.
100 rd.
8. 12 rd.
16 rd.
48 rd.
9. 305
10. 42

Page 222.

Exercise.

1. 100
2. 200
3. 400
4. 100
5. 200
6. 400
7. 10000
8. 20000
9. 40000

Page 223.

1. 1000
2. 1000

* Lead the pupil to find by trial that the largest rectangle having a given perimeter is *a square*.

† There are two prisms either of which will satisfy the conditions of this problem. One is 6 by 12 by 6; the other is 6 by 12 by 12.

3. 1000000
4. 1000
5. 2000
6. 8000
7. 25
8. 125
9. 100
10. 100
11. 10000

Page 224.

1. 1000
2. 6
3. 1 Kg.
4. 1000
5. 100
6. 10
7. 7.5 g.
8. 250 g.
9. .9 Kg.
10. 2500 Kg.
11. .8 Kg.

Page 225.

1. 60 sq. dm.
2. 100 sq. cm.
3. 125 cu. cm.
   $\frac{1}{8}$
4. 64 cu. dm.
   $\frac{8}{125}$
5. 96 sq. cm.
   $\frac{24}{25}$
6. 12 sq. yd.
   12 sq. m.
7. The second.
8. $8\frac{3}{4}$ sq. yd.
   $8\frac{3}{4}$ sq. m.
9. 20.4 cu. ft.
   20.4 cu. m.
10. 37.03 cu. m.
11. .5 Kg.

Page 227.

1. 15 dm. by 3 dm.
2. 7.2 m.
3. 5 cm.
4. 6.8 m. by 3.4 m.
   23.12 sq. m.
5. 488 grams.
   512 "
   More.
6. 20 m.; 40 m.; 46 m.
   More.
7. 40 Kg.
   43.6 Kg.
   More.

Page 228.

1. 12 dm.
   84 dm.
   Less.
2. 6 cm.
   8 cm.
   24 sq. cm.
   10 cm.
   Less.
3. 4.9 m.
   14.7 m.
4. 17640 m.
   52920 m.
   70.560 Km.
   44 mi.
5. 1.225 m.
   3.675 m.

Page 229.

5. 15.7+ in.
   21.9+ in.
   31.4+ in.
6. 1.91+ ft.
7. 2 t's
8. $\frac{1}{2}$

Page 230.

1. 10.6+ m.
2. 1.08+ dm.
3. 560+ yd.
   280+ yd.
4. 318+ m.
   159+ m.
5. 720+ rev.
6. 454+ rev.
7. 43+ yd.
8. 36+ m.
9. 24+ mi.
10. 64+ Km.
11. Nearly 1 A.
12. 1618+ ars.
13. 11+ cords.
14. 145+ sters.
15. 37+ qt.
16. 42+ l.
17. 88+ lb.
18. 18+ Kg.

Page 232.

Exercise.

1. 3 mi.
2. $5\frac{1}{2}$ mi.
3. 3 mi.
4. 5 ft. 5 in.
5. 10+ mi.
6. 90 ft.
7. 23 mi.
8. $7\frac{1}{5}$ rd.
9. 2 mi.
10. 3 mi.
11. $\frac{3}{5}$ mi.
12. 6 rd. 1 ft.
13. 12 rd. 2 ft.
14. 18 rd. 3 ft.
15. 199 rd.
16. 6 rd. 1 ft.

Problems.

1. 240+ rev.
2. No difference.
3. 7973 in.
4. 30 yd. 1 ft. 8 in.

Page 234.

1. 1.2 A.
2. 2 A.
3. 2.4 A.
4. 3.5 A.
5. 4.8 A.
6. 2.20 ch.
7. 2.35 ch.
8. 2.75 ch.
9. 2.05 ch.
10. 2.09 ch.
11. 1.8 A.
12. 1.6 A.
13. (1) 11.73+ A.
    (2) 25.92+ A.
    (3) 48.56+ A.
    a 103.51+ A.

Page 235.

1. (1) 6 breadths.
       2 feet.
   (2) 7 breadths.
       1 foot.
   (4) 40 yd.
       $37\frac{1}{3}$ yd.
   (5) First.
   (6) \$36
       \$34.80
2. 48 yd.*
3. $38\frac{1}{3}$ yd.

Page 236.

1. 106 sq. yd.
2. \$24.96
3. 9 rolls.
4. \$1.20†
5. \$100.50

Page 237.

1. 1 A.
2. 7 A.
3. 13 A.
4. $1\frac{1}{8}$ A.
5. $1\frac{1}{2}$ A.
   a $23\frac{5}{6}$ A.
6. 4 A.
7. $8\frac{1}{2}$ A.
8. $18\frac{3}{4}$ A.
9. $18\frac{3}{4}$ A.
10. 50 A.
    b 100 A.
11. 3 A.
12. $6\frac{3}{4}$ A.
13. $5\frac{3}{4}$ A.
14. $4\frac{1}{2}$ A.
15. 2 A.
    c 22 A.
16. 2 A.
17. 22 A.
18. 8 A.
19. 36 A.
20. 12 A.
    d 80 A.

Page 238.

1. 1 A.
2. $8\frac{1}{4}$ mi.
3. $8\frac{1}{4}$ mi.
4. 66 A.
5. 8 A.
6. $8\frac{1}{4}$ mi.

* Put the carpet down crosswise of the room and 9 strips each 16 long will be sufficient.

† A "single roll" would make three strips and therefore cover inches ($4\frac{1}{2}$ feet) of wall measured horizontally.

7. $6\frac{3}{16}$ mi.*
8. $2\frac{1}{16}$
9. $2\frac{3}{4}$ mi.
   880 rd.
   220 bu.
10. $4\frac{1}{8}$ mi.
    1320 rd.
    21780 ft.
11. 3555+ hills.

Page 240.

1. 314+ sq. ft. †
2. .78+ ft.; .78+ yd. .78+ rd.; .78+ mi.
3. 4 times .78 ‡
4. Less.
5. 17.8+ rd.
6. 101+ rd.
7. 50+ acres.
8. 94+ rd.
9. 17+ ft.; 18+ ft.
10. 113+ ft.

Page 241.

2. 864 cu. in.
3. 216 cu. in.
4. 9 cu. ft.
5. 1 cu. ft.

Page 242.

2. $533\frac{1}{3}$ ft.
3. 8 cd.
4. 8 : 1
5. $1.65
6. 24 cd.
   23 cd.
7. 6 ft.
8. 12 cd.
9. $1\frac{1}{3}$ cd.

Page 243.

1. 7.56 cd.
2. 18 ft. by 21 ft.
3. 72 ft.
4. 42 cu. yd.
5. $11\frac{1}{9}\%$
6. 66 cd.
7. 15625 lb.
8. 4500 lb.

Page 244.

1. 27 bricks.
2. 10780 b'ks.
3. 17 ft. by 20 ft.
4. 70 ft.
5. $37\frac{1}{3}$ cu. yd.
6. 24200 b'ks.
7. 1.8+
9. $1\frac{1}{2}$ T.§

Page 245.

a 51 ft.
1. 69 ft.
2. 59 ft.
3. 52 ft.
4. 96 ft.
5. 324 ft.

b 600 ft.

Page 246.

14-ft. boards.

1. 85 ft.
2. 120 ft.
3. 392 ft.
4. 336 ft.

a 933 ft.

16-ft boards.

1. 95 ft.
2. 155 ft.
3. 384 ft.
4. 544 ft.

b 1178 ft.

Page 247.

$1\frac{1}{4}$-in. boards.

1. 65 ft.
2. 108 ft.
3. 108 ft.
4. 48 ft.

a 329 ft.

2 × 4, 12's.

1. 128 ft.
2. 288 ft.
3. 400 ft.
4. 360 ft.
5. 480 ft.

* $\frac{3}{4}$ of $8\frac{1}{4}$ mi. = $6\frac{3}{16}$ miles. † Use the decimal, .785.

‡ More accurately, 4 times .785.

§ If the specific gravity of the brick and mortar is 1.8, the weight of the chimney is 3000 lb.

6. 1152 ft.
b 2808 ft.

Page 248.

Timbers.

1. 144 ft.
2. 456 ft.
3. 608 ft.
4. 476 ft.
5. 1275 ft.
6. 636 ft.
7. 1792 ft.
8. 1728 ft.
a 7115 ft.

Cost.

1. $3.12
2. $8.57
3. $3.52
4. $8.06
5. $12.00
6. $5.13
b $40.40

Page 249.

1. 288 cu. in.
2. 282+ cu. in.

Page 250.

1. 360 cu. in.
2. 360 cu. in.
3. 561+ cu. ft.*
4. Nearly 2900 ft.
5. 9+ cords.
6. About 5.6 M.
7. About 15 T.
8. 100 Kg.
9. 3125 lb.†
10. 3375 lb.

Page 251.

1. About 720 gal.
2. About 376 gal.§
3. Nearly 23 bbl.
4. About 40 bbl.
6. About 160 bbl.
7. About 320 bbl.

Page 252.

1. About 512 bu.
2. 10 ft. × 10 ft. × $12\frac{1}{2}$ ft.
3. About 864 bu.
4. About 128 bu.
5. 2844 bu.

Page 253.

1. $7.28
2. $19.87
3. $44.40
4. $31.55
a $103.10

Page 254.

1. $9.60
2. $4.29
3. $33.75
4. $37.50
5. $13.68
a $98.82
6. $16.05
7. $10.70
8. $32.10
9. $16.05
10. $16.05
b $90.95
11. $54.60
12. $6.50
13. $18.63
14. $1.86
15. $2.66
c $84.19
16. 310 lb. to 340 lb.‡
17. 2+ lb.
18. 3600 lb. to 3800 lb.
19. 3000 lb.
20. $32\frac{1}{2}$ lb.

Page 255.

1. 6 ℔ 0℥ 7℥ 1ȝ
2. 87+
3. $2430\frac{5}{9}$ lb.
4. $19\frac{3}{11}\frac{1}{5}$

* This answer is an approximation obtained by using the incomplete decimal, .78. If the more nearly accurate decimal, .785, be employed, the answer is 565+ cu. ft., which is true to units of feet.

† There are (1000 ÷ 12) $83\frac{1}{3}$ *cubic* feet of lumber in 1000 feet of 1-inch boards.

‡ This does not include the weight of the barrel itself.

§ Use the decimal, .785.

SUPPLEMENTARY "SEAT WORK."

ONE HUNDRED LESSONS FOR DRILL IN ACCURACY.

To THE TEACHER.—Pupils should be encouraged not only to obtain correct answers to each problem in a given lesson, but the more active pupils may find the sum of the answers, if these are like numbers. Indeed, the *one requirement* may be, in Lesson I., "*Find the sum of the ten sums*"; in Lesson II., "*Find the sum of the ten differences*"; in Lesson III., "*Find the sum of the ten products,*" etc.

Frequently remind the pupil that inaccurate work is valueless. *Insist upon accuracy.* In work of this kind nothing short of perfect accuracy is commendable. The lesson for "seat work" should be of such character and length that a majority of the pupils in the class *can* make correct papers; then divide the papers made, into two classes only—the correct and the incorrect. Impress upon the pupils the fact that a "90 per cent" accountant is a complete failure. Impress upon yourself the fact that "90 per cent" pupils make "90 per cent" accountants. Happy is the pupil who learns, before he enters the school of experience, that carelessness is unprofitable.

Lesson I.

(a)	(b)	(c)	(d)	(e)
47	53	234	4386	36425
88	12	269	2467	54387
75	25	425	1382	23471
36	44	766	5614	63575
82	18	631	7533	45613

(f) 75 + 36 + 42 + 81 + 37 + 85 + 24 + 52 + 36 + 45 =
(g) 64 + 58 + 19 + 63 + 15 + 76 + 48 + 64 + 55 + 25 =
(h) 37 + 83 + 21 + 25 + 60 + 31 + 42 + 38 + 36 + 53 =
(i) 17 + 79 + 75 + 40 + 69 + 58 + 62 + 64 + 47 + 63 =
(j) 15 + 85 + 27 + 73 + 46 + 54 + 34 + 66 + 22 + 78 =

Find the sum of the ten sums.

Lesson II.

SUBTRACTION.

(a)	(b)	(c)	(d)	(e)
294	326	8754	7356	62451
138	182	2388	1792	38170

(f)	(g)	(h)	(i)	(j)
358	596	6347	5286	74265
192	148	2518	2791	52839

Find the sum of the ten differences.

Lesson III.

(a) Multiply 3254 by 3.
(b) Multiply 3254 by 5.
(c) Multiply 1687 by 4.
(d) Multiply 2539 by 3.
(e) Multiply 1465 by 9.

(f) $3254 \times 8 =$
(g) $3254 \times 4 =$
(h) $1687 \times 6 =$
(i) $2539 \times 7 =$
(j) $8535 \times 9 =$

Find the sum of the ten products.

Lesson IV.

(a) Multiply 234 by 35.
(b) Multiply 324 by 27.
(c) Multiply 215 by 41.
(d) Multiply 502 by 62.
(e) Multiply 254 by 89.

(f) $766 \times 35 =$
(g) $676 \times 27 =$
(h) $785 \times 41 =$
(i) $498 \times 62 =$
(j) $746 \times 89 =$

Find the sum of the ten products.

TO THE TEACHER.—Encourage pupils to "prove" problems whenever this is practicable; otherwise, to solve twice, comparing the answers obtained after the second solution is complete. Let them learn early that *it takes more time to find and correct errors than it does to avoid them.*

Lesson V.

(a) Multiply 475 by 50.
(b) Multiply 475 by 70.
(c) Multiply 368 by 60.
(d) Multiply 368 by 80.
(e) Multiply 129 by 40.
(f) $475 \times 600 =$
(g) $475 \times 280 =$
(h) $368 \times 400 =$
(i) $368 \times 460 =$
(j) $129 \times 960 =$

Find the sum of the ten products.

Lesson VI.

(a) Divide 42960 by 2.
(b) Divide 42960 by 3.
(c) Divide 42960 by 4.
(d) Divide 42960 by 5.
(e) Divide 42960 by 6.
(f) $43785 \div 7 =$
(g) $51736 \div 8 =$
(h) $35685 \div 9 =$
(i) $32780 \div 10 =$
(j) $38742 \div 11 =$

Find the sum of the ten quotients.

Lesson VII.

(a) Divide twenty-four thousand one hundred six by 2.
(b) Divide eight thousand two hundred fourteen by 3.
(c) Divide thirty-six thousand twenty-eight by 4.
(d) Divide fifteen thousand six hundred five by 5.
(e) Divide nine thousand nine hundred twelve by 6.
(f) Divide forty-five thousand twenty-four by 7.
(g) Divide two hundred fifty-four thousand by 8.
(h) Divide seven thousand five hundred sixty by 9.
(i) Divide 48961 by 11.
(j) 38712 by 12.

Find the sum of the ten quotients.

Lesson VIII.

(a) Divide 34250 by 25.
(b) Divide 32292 by 26.
(c) Divide 58344 by 24.
(d) Divide 84834 by 27.
(e) Divide 35121 by 23.
(f) 70422 ÷ 33 =
(g) 45084 ÷ 34 =
(h) 83648 ÷ 32 =
(i) 88725 ÷ 35 =
(j) 38254 ÷ 31 =

Find the sum of the ten quotients.

Lesson IX.

(a) Divide 44750 by 125.
(b) Divide 85250 by 250.
(c) Divide 57050 by 175.
(d) Divide 30444 by 129.
(e) Divide 87975 by 225.
(f) 45108 ÷ 358 =
(g) 85591 ÷ 341 =
(h) 57376 ÷ 326 =
(i) 30680 ÷ 236 =
(j) 88366 ÷ 391 =

Find the sum of the ten quotients.

Lesson X.

(a) Divide one million by one hundred twenty-five.
(b) Divide one million by two hundred fifty.
(c) Divide one million by twenty-five hundred.
(d) Divide one million by twelve hundred fifty.
(e) Divide one million by five hundred.
(f) Divide one million by five thousand.
(g) Divide one million by twenty-five thousand.
(h) Divide one million by one hundred thousand.
(i) Divide 1,000,000 by 2.
(j) 1,000,000 ÷ 8 =

Find the sum of the ten quotients.

Lesson XI.

(a) Add $\frac{1}{2}$, $\frac{3}{4}$, and $\frac{2}{5}$.

(b) Add $\frac{2}{3}$, $\frac{1}{4}$, and $\frac{5}{6}$.

(c) Add $\frac{2}{5}$, $\frac{1}{6}$, and $\frac{3}{4}$.

(d) Add $\frac{1}{3}$, $\frac{1}{5}$, and $\frac{1}{6}$.

(e) Add $\frac{2}{3}$, $\frac{1}{6}$, and $\frac{3}{5}$.

(f) Add $\frac{1}{2}$, $\frac{1}{4}$, and $\frac{4}{5}$.

(g) Add $\frac{2}{3}$, $\frac{3}{4}$, and $\frac{1}{6}$.

(h) Add $\frac{4}{5}$, $\frac{5}{6}$, and $\frac{1}{4}$.

(i) Add $\frac{2}{3}$, $\frac{4}{5}$, and $\frac{5}{6}$.

(j) Add $\frac{1}{3}$, $\frac{5}{6}$, and $\frac{3}{5}$.

Find the sum of the ten sums.

Lesson XII.

(a) Add $\frac{3}{8}$, $\frac{7}{10}$, and $\frac{5}{12}$.

(b) Add $\frac{3}{4}$, $\frac{1}{10}$, and $\frac{1}{12}$.

(c) Add $\frac{1}{2}$, $\frac{9}{10}$, and $\frac{3}{4}$.

(d) Add $\frac{1}{6}$, $\frac{1}{10}$, and $\frac{5}{12}$.

(e) Add $\frac{3}{5}$, $\frac{3}{10}$, and $\frac{11}{12}$.

(f) Add $\frac{5}{8}$, $\frac{3}{10}$, and $\frac{7}{12}$.

(g) Add $\frac{3}{4}$, $\frac{9}{10}$, and $\frac{11}{12}$.

(h) Add $\frac{2}{5}$, $\frac{3}{10}$, and $\frac{1}{4}$.

(i) Add $\frac{5}{6}$, $\frac{9}{10}$, and $\frac{7}{12}$.

(j) Add $\frac{3}{5}$, $\frac{7}{10}$, and $\frac{1}{12}$.

Find the sum of the ten sums.

Lesson XIII.

Find the l. c. m.:

(a) Of 24 and 36.

(b) Of 35 and 45.

(c) Of 28 and 42.

(d) Of 60 and 72.

(e) Of 75 and 90.

(f) Of 36, 60, and 72.

(g) Of 25, 40, and 60.

(h) Of 28, 42, and 56.

(i) Of 24, 40, and 64.

(j) Of 18, 24, and 30.

Find the sum of the ten l. c. m.'s.

Lesson XIV.

(a) Add $\frac{7}{24}$ and $\frac{11}{36}$.

(b) Add $\frac{13}{24}$ and $\frac{1}{3}$.

(c) Add $\frac{11}{18}$ and $\frac{1}{24}$.

(d) Add $\frac{2}{9}$ and $\frac{13}{48}$.

(e) Add $\frac{2}{9}$ and $\frac{5}{48}$.

(f) Add $\frac{5}{24}$ and $\frac{13}{36}$.

(g) Add $\frac{5}{18}$ and $\frac{17}{24}$.

(h) Add $\frac{1}{9}$ and $\frac{5}{24}$.

(i) Add $\frac{5}{9}$ and $\frac{25}{48}$.

(j) $\frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \frac{1}{48} =$

Find the sum of the ten sums.

Lesson XV.

(a) Add $\frac{7}{20}$ and $\frac{4}{9}$.

(b) Add $\frac{2}{5}$ and $\frac{11}{18}$.

(c) Add $\frac{8}{9}$ and $\frac{1}{10}$.

(d) Add $\frac{1}{4}$ and $\frac{23}{45}$.

(e) $\frac{1}{2} + \frac{1}{3} + \frac{1}{5} + \frac{1}{6} =$

(f) Add $\frac{3}{5}$ and $\frac{7}{18}$.

(g) Add $\frac{9}{10}$ and $\frac{1}{9}$.

(h) Add $\frac{3}{4}$ and $\frac{22}{45}$.

(i) Add $\frac{13}{20}$ and $\frac{5}{9}$.

(j) $\frac{1}{9} + \frac{1}{10} + \frac{1}{15} + \frac{47}{90} =$

Find the sum of the ten sums.

Lesson XVI.

(a) From $\frac{7}{10}$ subtract $\frac{2}{3}$.

(b) From $\frac{2}{5}$ subtract $\frac{1}{6}$

(c) From $\frac{11}{12}$ subtract $\frac{1}{5}$.

(d) From $\frac{5}{8}$ subtract $\frac{1}{10}$.

(e) From $\frac{9}{10}$ subtract $\frac{1}{6}$.

(f) From $\frac{5}{12}$ subtract $\frac{2}{5}$.

(g) From $\frac{2}{3}$ subtract $\frac{2}{5}$.

(h) From $\frac{7}{8}$ subtract $\frac{7}{10}$.

(i) From the sum of $\frac{1}{3}$ and $\frac{1}{6}$ subtract $\frac{1}{5}$.

(j) From the sum of $\frac{3}{5}$ and $\frac{2}{3}$ subtract $\frac{4}{15}$.

Find the sum of the ten differences.

Lesson XVII.

(a) From $\frac{11}{25}$ subtract $\frac{2}{15}$.

(b) From $\frac{38}{75}$ subtract $\frac{3}{10}$.

(c) From $\frac{59}{75}$ subtract $\frac{3}{5}$.

(d) From $\frac{23}{30}$ subtract $\frac{7}{15}$.

(e) From $\frac{4}{15}$ subtract $\frac{7}{30}$.

(f) From $\frac{21}{25}$ subtract $\frac{4}{15}$.

(g) From $\frac{53}{75}$ subtract $\frac{1}{10}$.

(h) From $\frac{18}{25}$ subtract $\frac{3}{5}$.

(i) From $\frac{29}{30}$ subtract $\frac{3}{10}$.

(j) From $\frac{39}{50}$ subtract $\frac{7}{25}$.

Find the sum of the ten differences.

Lesson XVIII.

(a) From $\frac{7}{8}$ subtract $\frac{5}{9}$.

(b) From $\frac{5}{8}$ subtract $\frac{2}{9}$.

(c) From $\frac{1}{2}$ subtract $\frac{2}{9}$.

(d) From $\frac{13}{20}$ subtract $\frac{5}{12}$.

(e) From $\frac{11}{18}$ subtract $\frac{1}{5}$.

(f) From $\frac{5}{12}$ subtract $\frac{1}{5}$.

(g) From $\frac{11}{12}$ subtract $\frac{7}{10}$.

(h) From $\frac{2}{3}$ subtract $\frac{1}{10}$.

(i) From $\frac{7}{20}$ subtract $\frac{1}{12}$.

(j) From $\frac{7}{18}$ subtract $\frac{3}{10}$.

Find the sum of the ten differences.

Lesson XIX.

(a) Multiply 276 by $\frac{7}{12}$.

(b) Multiply 276 by $\frac{3}{4}$.

(c) Multiply 276 by $\frac{1}{3}$.

(d) Multiply 276 by $\frac{1}{4}$.

(e) Multiply 276 by $\frac{5}{6}$.

(f) Multiply 276 by $\frac{2}{3}$.

(g) Multiply 276 by $\frac{5}{12}$.

(h) Multiply 276 by $\frac{1}{6}$.

(i) Multiply the sum of 895 and 374 by $\frac{3}{5}$.

(j) Multiply the sum of 733 and 536 by $\frac{2}{5}$.

Find the sum of the ten products.

Lesson XX.

(a) Multiply $\frac{5}{8}$ by 359.

(b) Multiply $\frac{7}{12}$ by 359.

(c) Multiply $\frac{11}{24}$ by 359.

(d) Multiply $\frac{3}{7}$ by 276.

(e) Multiply $\frac{2}{5}$ by 276.

(f) Multiply $\frac{5}{6}$ by 359.

(g) Multiply $\frac{9}{16}$ by 359.

(h) Multiply $\frac{15}{16}$ by 359.

(i) Multiply $\frac{1}{35}$ by 276.

(j) Multiply $\frac{1}{7}$ by 276.

Find the sum of the ten products.

Lesson XXI.

(a) Multiply $\frac{7}{13}$ by $\frac{5}{9}$.

(b) Multiply $\frac{7}{13}$ by $\frac{3}{15}$.

(c) Multiply $\frac{7}{13}$ by $\frac{4}{9}$.

(d) Multiply $\frac{7}{13}$ by $\frac{2}{15}$.

(e) Multiply $\frac{7}{13}$ by $\frac{19}{45}$.

(f) Multiply $\frac{7}{13}$ by $\frac{1}{3}$.

(g) Multiply $\frac{7}{13}$ by $\frac{11}{45}$.

(h) Multiply $\frac{7}{13}$ by $\frac{2}{9}$.

(i) Multiply $\frac{7}{13}$ by $\frac{2}{3}$.

(j) Multiply $\frac{7}{13}$ by $\frac{7}{9}$.

Find the sum of the ten products.

Lesson XXII.

(a) Divide 347 by $\frac{3}{5}$.

(b) Divide 256 by $\frac{4}{7}$.

(c) Divide 338 by $\frac{2}{11}$.

(d) Divide 721 by $\frac{5}{7}$.

(e) Divide 347 by $\frac{3}{4}$.

(f) Divide 256 by $\frac{4}{9}$.

(g) Divide 338 by $\frac{2}{13}$.

(h) Divide 721 by $\frac{5}{8}$.

(i) Divide the difference of 769 and 282 by $\frac{2}{3}$.

(j) Divide the sum of 138 and 349 by $\frac{2}{5}$.

Find the sum of the ten quotients.

Lesson XXIII.

(a) Divide $\frac{3}{4}$ by 5.

(b) Divide $\frac{7}{12}$ by 5.

(c) Divide $\frac{3}{10}$ by 6.

(d) Divide $\frac{11}{4}$ by 5.

(e) Divide $\frac{8}{15}$ by 4.

(f) Divide $\frac{7}{4}$ by 5.

(g) Divide $\frac{7}{15}$ by 4.

(h) Divide $\frac{9}{5}$ by 6.

(i) Divide $\frac{7}{10}$ by 3.

(j) Divide $\frac{21}{10}$ by 6.

Find the sum of the ten quotients.

Lesson XXIV.

(a) Divide $\frac{3}{5}$ by $\frac{2}{7}$.

(b) Divide $\frac{5}{6}$ by $\frac{2}{9}$.

(c) Divide $\frac{3}{4}$ by $\frac{3}{7}$.

(d) Divide $\frac{3}{10}$ by $\frac{6}{11}$.

(e) Divide $\frac{7}{12}$ by $\frac{5}{2}$.

(f) Divide $\frac{3}{5}$ by $\frac{2}{11}$.

(g) Divide $\frac{5}{6}$ by $\frac{2}{13}$.

(h) Divide $\frac{3}{4}$ by $\frac{3}{11}$.

(i) Divide $\frac{3}{10}$ by $\frac{6}{13}$.

(j) Divide $\frac{7}{12}$ by $\frac{5}{4}$.

Find the sum of the ten quotients.

Lesson XXV.

(a) From 386 subtract $124\frac{3}{7}$.

(b) From 875 subtract $306\frac{3}{28}$.

(c) From 724 subtract $136\frac{5}{7}$.

(d) From 900 subtract $145\frac{5}{28}$.

(e) From 537 subtract $241\frac{5}{8}$.

(f) From 574 subtract $196\frac{3}{56}$.

(g) From 804 subtract $237\frac{3}{8}$.

(h) From 391 subtract $104\frac{11}{56}$.

(i) From the sum of 246 and 374 subtract $435\frac{1}{8}$.

(j) From the sum of 208 and 504 subtract $387\frac{1}{2}$

Find the sum of the ten differences.

Lesson XXVI.

(a) From $189\frac{1}{2}$ subtract $65\frac{3}{5}$.

(b) From $534\frac{7}{18}$ subtract $85\frac{4}{5}$.

(c) From $624\frac{4}{45}$ subtract $74\frac{5}{9}$.

(d) From $471\frac{2}{15}$ subtract $86\frac{5}{6}$.

(e) From $904\frac{1}{5}$ subtract $38\frac{1}{4}$.

(f) From $274\frac{1}{6}$ subtract $87\frac{1}{3}$.

(g) From $246\frac{4}{15}$ subtract $91\frac{5}{6}$.

(h) From $431\frac{1}{90}$ subtract $85\frac{2}{9}$.

(i) From $756\frac{7}{15}$ subtract $82\frac{2}{3}$.

(j) From $600\frac{1}{2}$ subtract $53\frac{3}{5}$.

Find the sum of the ten differences.

Lesson XXVII.

(a) Multiply $28\frac{3}{5}$ by 6.

(b) Multiply $39\frac{3}{10}$ by 7.

(c) Multiply $18\frac{3}{5}$ by 9.

(d) Multiply $25\frac{3}{4}$ by 8.

(e) Multiply $18\frac{11}{20}$ by 6.

(f) Multiply $17\frac{2}{5}$ by 8.

(g) Multiply $26\frac{1}{4}$ by 9.

(h) Multiply $47\frac{7}{10}$ by 6.

(i) Multiply $16\frac{4}{5}$ by 7.

(j) Multiply $27\frac{19}{20}$ by 5.

Find the sum of the ten products.

Lesson XXVIII.

(a) Multiply 231 by $3\frac{1}{4}$.

(b) Multiply 428 by $4\frac{1}{8}$.

(c) Multiply 608 by $5\frac{1}{3}$.

(d) Multiply 275 by $2\frac{1}{6}$.

(e) Multiply 231 by $4\frac{3}{4}$.

(f) Multiply 428 by $4\frac{7}{8}$.

(g) Multiply 608 by $5\frac{2}{3}$.

(h) Multiply 275 by $3\frac{5}{6}$.

(i) Multiply the difference of 960 and 234 by $4\frac{7}{12}$.

(j) Multiply the sum of 476 and 250 by $\frac{5}{12}$.

Find the sum of the ten products.

Lesson XXIX.*

(a) Multiply $324\frac{1}{2}$ by $4\frac{1}{2}$.

(b) Multiply $225\frac{1}{2}$ by $2\frac{1}{3}$.

(c) Multiply $528\frac{1}{6}$ by $3\frac{1}{4}$.

(d) Multiply $174\frac{1}{2}$ by $4\frac{1}{6}$.

(e) Multiply $432\frac{1}{12}$ by $3\frac{1}{2}$.

(f) Multiply $324\frac{1}{2}$ by $5\frac{1}{2}$.

(g) Multiply $225\frac{1}{2}$ by $3\frac{2}{3}$.

(h) Multiply $528\frac{1}{6}$ by $2\frac{3}{4}$.

(i) Multiply $174\frac{1}{2}$ by $3\frac{5}{6}$.

(j) Multiply $432\frac{1}{12}$ by $8\frac{1}{2}$.

Find the sum of the ten products.

Lesson XXX.

(a) Multiply $6\frac{1}{5}$ by $4\frac{1}{2}$.

(b) Multiply $7\frac{2}{5}$ by $4\frac{3}{4}$.

(c) Multiply $5\frac{3}{10}$ by $3\frac{1}{2}$.

(d) Multiply $4\frac{1}{4}$ by $4\frac{2}{5}$.

(e) Multiply $8\frac{1}{2}$ by $2\frac{1}{5}$.

(f) Multiply $6\frac{1}{5}$ by $3\frac{1}{2}$.

(g) Multiply $7\frac{2}{5}$ by $2\frac{1}{4}$.

(h) Multiply $5\frac{3}{10}$ by $5\frac{1}{2}$.

(i) Multiply $4\frac{1}{4}$ by $2\frac{3}{5}$.

(j) Multiply $8\frac{1}{2}$ by $3\frac{4}{5}$.

Find the sum of the ten products.

Lesson XXXI.

(a) Divide 274 by $2\frac{1}{2}$.

(b) Divide 375 by $3\frac{1}{3}$.

(c) Divide 256 by $7\frac{1}{2}$.

(d) Divide 425 by $1\frac{2}{3}$.

(e) Divide 274 by $1\frac{2}{3}$.

(f) Divide 375 by $1\frac{3}{7}$.

(g) Divide 256 by $1\frac{2}{13}$.

(h) Divide 425 by $2\frac{1}{2}$.

(i) Divide the difference of 675 and 247 by $6\frac{1}{4}$.

(j) Divide the sum of 142 and 286 by $1\frac{4}{21}$.

Find the sum of the ten quotients.

* Do not reduce the numbers in this lesson to improper fractions.

Lesson XXXII.

(a) Divide $347\frac{3}{5}$ by 2.
(b) Divide $347\frac{3}{5}$ by 6.
(c) Divide $574\frac{2}{3}$ by 5.
(d) Divide $577\frac{1}{2}$ by 8.
(e) Divide $577\frac{1}{2}$ by 7.
(f) Divide $347\frac{3}{5}$ by 3.
(g) Divide $574\frac{2}{3}$ by 4.
(h) Divide $574\frac{2}{3}$ by 20.
(i) Divide $577\frac{1}{2}$ by 14.
(j) Divide $577\frac{1}{2}$ by 28.

Find the sum of the ten quotients.

Lesson XXXIII.

Reduce to whole or mixed numbers:

(a) $\frac{377}{2}$ (b) $\frac{247}{3}$ (c) $\frac{895}{4}$ (d) $\frac{324}{5}$ (e) $\frac{125}{6}$
(f) $\frac{574}{7}$ (g) $\frac{384}{8}$ (h) $\frac{288}{9}$ (i) $\frac{346}{10}$ (j) $\frac{436}{12}$

Find the sum of the ten numbers.

Lesson XXXIV.

Reduce to improper fractions:

(a) $85\frac{2}{3}$ (b) $76\frac{3}{4}$ (c) $38\frac{5}{7}$ (d) $37\frac{2}{5}$ (e) $96\frac{1}{2}$
(f) $95\frac{3}{8}$ (g) $47\frac{1}{6}$ (h) $58\frac{2}{9}$ (i) $72\frac{3}{10}$ (j) $83\frac{5}{12}$

Find the l. c. m. of the ten denominators.

Lesson XXXV.

Reduce to their lowest terms:

(a) $\frac{150}{225}$ (b) $\frac{108}{144}$ (c) $\frac{105}{147}$ (d) $\frac{86}{215}$ (e) $\frac{347}{694}$
(f) $\frac{39}{104}$ (g) $\frac{35}{210}$ (h) $\frac{54}{243}$ (i) $\frac{45}{150}$ (j) $\frac{40}{96}$

Find the sum of the ten fractions.

Lesson XXXVI.

Reduce to simple fractions:

(a) $\frac{3}{5}$ of $\frac{5}{6}$ (b) $\frac{2}{3}$ of $\frac{9}{20}$ (c) $\frac{3}{4}$ of $4\frac{1}{2}$ (d) $\frac{2}{5}$ of $\frac{10}{12}$

(e) $\frac{2}{7}$ of $5\frac{1}{4}$ (f) $\frac{5}{6}$ of 2 (g) $\frac{3}{8}$ of $2\frac{2}{3}$ (h) $\frac{2}{9}$ of $3\frac{3}{5}$

(i) $\frac{3}{7}$ of $8\frac{2}{5}$ (j) $\frac{5}{8}$ of 12.

Find the sum of the ten numbers.

Lesson XXXVII.

Reduce to simple fractions:

(a) $\frac{4\frac{1}{2}}{9}$ (b) $\frac{5\frac{1}{2}}{8}$ (c) $\frac{4\frac{2}{3}}{8}$ (d) $\frac{2\frac{1}{4}}{6}$

(e) $\frac{3}{4\frac{1}{2}}$ (f) $\frac{4}{6\frac{2}{3}}$ (g) $\frac{3}{3\frac{2}{3}}$ (h) $\frac{5}{6\frac{1}{4}}$

(i) $\frac{2\frac{2}{3}}{5\frac{2}{3}}$ (j) $\frac{4\frac{1}{2}}{6\frac{1}{4}}$

Find the sum of the ten fractions.

Lesson XXXVIII.

(a) Add 612 and four and twenty-five thousandths.

(b) Add 8.34 and seven and thirty-six hundredths.

(c) Add 92.5 and eighteen and seven hundredths.

(d) Add 4.36 and twenty-one and nine thousandths.

(e) Add 236 and fifteen and thirty-four hundredths.

(f) Add 18.4 and six and forty-eight ten-thousandths.

(g) Add 3.75 and seventy-eight millionths.

(h) Add 4.62 and four thousand seven hundred.

(i) Add .444 and four hundred forty-four millionths.

(j) Add 36.5 and thirty-six and five tenths.

Find the sum of the ten sums.

Lesson XXXIX.

(a) From 8.241 subtract 97 hundredths.
(b) From 72.46 subtract 324 tenths.
(c) From 837.5 subtract 427 ten-thousandths.
(d) From 3.624 subtract 3467 ten-thousandths.
(e) From 942.6 subtract five hundred thirty-six.
(f) From 52.36 subtract 7 and 35 thousandths.
(g) From 7.231 subtract 5 and 46 hundredths.
(h) From 630.2 subtract 48 and 75 thousandths.
(i) From 1000 subtract 234 thousandths.
(j) From 10 subtract 436 ten-thousandths.

Find the sum of the ten differences.

Lesson XL.

(a) Multiply 436 by .2
(b) Multiply 436 by .16
(c) Multiply 436 by .07
(d) Multiply 436 by .005
(e) Multiply 436 by .125
(f) Multiply 436 by .03
(g) Multiply 436 by .24
(h) Multiply 436 by .08
(i) Multiply 436 by .025
(j) Multiply 436 by .065

Find the sum of the ten products.

Lesson XLI.

(a) Multiply 28.75 by 3.
(b) Multiply 2.536 by 4.
(c) Multiply 423.7 by 2.
(d) Multiply 2.534 by 38.
(e) Multiply 54.29 by 26.
(f) Multiply 28.75 by 7.
(g) Multiply 2.536 by 6.
(h) Multiply 423.7 by 8.
(i) Multiply 2.534 by 62.
(j) Multiply 54.29 by 74.

Find the sum of the ten products.

Lesson XLII.

(a) Multiply 34.26 by 2.7
(b) Multiply 253.8 by .36
(c) Multiply 3.426 by 4.5
(d) Multiply 38.5 by 4.25
(e) Multiply 239 by 3.46
(f) Multiply 34.26 by 7.3
(g) Multiply 253.8 by .64
(h) Multiply 3.426 by 5.5
(i) Multiply 38.5 by 5.75
(j) Multiply 239 by 6.54

Find the sum of the ten products.

Lesson XLIII.

(a) Divide 864 by .2
(b) Divide 864 by .6
(c) Divide 372 by .75
(d) Divide 285 by 7.5
(e) Divide 437 by .08
(f) Divide 864 by .3
(g) Divide 436 by .25
(h) Divide 355 by 2.5
(i) Divide 896 by .05
(j) Divide 460 by .8

Find the sum of the ten quotients.

Lesson XLIV.

(a) Divide 836 and 22 hundredths by 6.
(b) Divide 734 and 16 thousandths by 6.
(c) Divide 345 and 6 tenths by 6.
(d) Divide 272 and 34 hundredths by 6.
(e) Divide 146 and 4 thousandths by 6.
(f) Divide 287 and 25 hundredths by 5.
(g) Divide 342 and 34 thousandths by 5.
(h) Divide 629 and 125 thousandths by 5.
(i) Divide 315 and 6 tenths by 5.
(j) Divide 149 and 25 thousandths by 5.

Find the sum of the ten quotients.

Lesson XLV.

(a) Divide 375.50 by 25.
(b) Divide 46.225 by .25
(c) Divide 286.50 by 2.5
(d) Divide 381.25 by .025
(e) Divide 2.7575 by .25
(f) Divide 375.50 by 2.5
(g) Divide 38.275 by .025
(h) Divide 2.8625 by .25
(i) Divide 48.275 by 25.
(j) Divide 314.50 by .025

Find the sum of the ten quotients.

Lesson XLVI.

Reduce to decimals:

(a) $\frac{7}{8}$ (b) $\frac{3}{4}$ (c) $\frac{5}{8}$ (d) $\frac{1}{4}$ (e) $\frac{3}{8}$

(f) $\frac{3}{40}$ (g) $\frac{1}{8}$ (h) $\frac{7}{40}$ (i) $\frac{11}{20}$ (j) $\frac{1}{5}$

Find the sum of the ten decimals.

Lesson XLVII.

Reduce to common fractions:

(a) .25 (b) .125 (c) .75 (d) .375 (e) .625

(f) .15 (g) .02$\frac{1}{2}$ (h) .85 (i) .875 (j) .975

Find the sum of the ten common fractions.

Lesson XLVIII.

Reduce to common fractions:

(a) .33$\frac{1}{3}$ (b) .14$\frac{2}{7}$ (c) .66$\frac{2}{3}$ (d) .57$\frac{1}{7}$ (e) .28$\frac{4}{7}$

(f) .1$\frac{1}{9}$ (g) .2$\frac{2}{9}$ (h) .3$\frac{1}{3}$ (i) .4$\frac{4}{9}$ (j) .8$\frac{8}{9}$

Find the sum of the ten common fractions.

Lesson XLIX.

ADDITION.

(a) 5 bu. 2 pk. 3 qt.
3 bu. 1 pk. 7 qt.
2 bu. 3 pk. 3 qt.

(b) 3 yd. 2 ft. 7 in.
4 yd. 1 ft. 8 in.
6 yd. 2 ft. 9 in.

(c) 21 lb. 7 oz. + 14 lb. 5 oz. + 13 lb. 9 oz.

(d) 4 T. 1460 lb. + 2 T. 390 lb. + 3 T. 1240 lb.

(e) 2 A. 24 sq. rd. + 3 A. 36 sq. rd. + 4 A. 43 sq. rd.

(f) 5 gal. 3 qt. 1 pt. + 7 gal. 2 qt. + 4 gal. 1 qt. 1 pt.

Lesson L.

SUBTRACTION.

(a) 8 bu. 2 pk. 1 qt.
3 bu. 3 pk. 5 qt.

(b) 7 yd. 1 ft. 5 in.
2 yd. 2 ft. 8 in.

(c) 7 sq. ft. 72 sq. in. less 3 sq. ft. 96 sq. in.

(d) 5 cu. ft. 375 cu. in. less 2 cu. ft. 894 cu. in.

(e) 8 gal. 2 qt. 1 pt. less 5 gal. 3 qt. 1 pt.

(f) 9 cords 64 cu. ft. less 2 cords 96 cu. ft.

Lesson LI.

MULTIPLICATION.

(a) 3 hr. 15 min. 25 sec. × 4

(b) 12 yd. 2 ft. 10 in. × 6

(c) 2 T. 1250 lb. × 5.

(d) 12 bu. 3 pk. 5 qt. × 8.

(e) 15 lb. 12 oz. × 9.

(f) 6 mi. 180 rd. × 4.

(g) 3 cd. 64 cu. ft. × 7.

(h) 6 sq. ft. 36 sq. in. × 6.

(i) 12 wk. 5 da. × 8.

(j) 5 A. 72 sq. rd. × 3.

Lesson LII.

DIVISION.

(a) 4)17 T. 1960 lb. (b) 6)55 bu. 2 pk.

(c) 27 gal. 2 qt. ÷ 5.
(d) 13 A. 40 sq. rd. ÷ 4.
(e) 15 hr. 30 min. ÷ 6.
(f) 25 cu. ft. 576 cu. in. ÷ 12.
(g) 37 pk. 5 qt. ÷ 7.
(h) 57 mi. 80 rd. ÷ 2.
(i) 5 sq. ft. 72 sq. in. ÷ 4.
(j) 16 lb. 9 oz. ÷ 5.

Lesson LIII.

DIVISION.

(a) 4 in.)7 ft. 8 in. (b) 6 qt.)15 bu. 3 pk.

(c) Divide 3 tons 450 pounds by 150 pounds.
(d) Divide 10 yards 2 feet by 8 inches.
(e) Divide 6 acres 15 sq. rods by 25 sq. rods.
(f) Divide 5 cords 60 cu. feet by 50 cu. feet.
(g) Divide 11 pounds 9 ounces by 5 ounces.
(h) Divide 7 hours 48 minutes by 12 minutes.
(i) Divide 8 sq. feet 80 sq. inches by 16 sq. inches.
(j) Divide 18 sq. rods by 3 square yards.

Lesson LIV.

(a) 8 ft. less 1 ft. 10 in.
(b) 12 yd. less 3 yd. 2 ft.
(c) 14 ft. less 4 ft. 3 in.
(d) 10 yd. less 2 yd. 1 ft.
(e) 12 yd. less 1 ft. 4 in.
(f) 10 ft. less 1 ft. 2 in.
(g) 15 yd. less 2 yd. 1 ft.
(h) 17 ft. less 2 ft. 9 in.
(i) 12 yd. less 3 yd. 2 ft.
(j) 12 yd. less 1 ft. 8 in.

Find the sum of the ten differences.

Lesson LV.

(a) 10 pk. less 3 pk. 2. qt.
(b) 5 bu. less 1 bu. 3 pk.
(c) 35 qt. less 2 pk. 3 qt.
(d) 7 bu. less 2 bu. 2 pk.
(e) 8 bu. less 2 pk. 3 qt.
(f) 8 pk. less 2 pk. 6 qt.
(g) 6 bu. less 2 bu. 1 pk.
(h) 38 qt. less 2 pk. 6 qt.
(i) 9 bu. less 4 bu. 2 pk.
(j) 8 bu. less 1 pk. 5 qt.

Find the sum of the ten differences.

Lesson LVI.

Change to feet:

(a) 8 rods 1 yd.
(b) 33 yards.
(c) 15 rods.
(d) 19 rods 2 ft.
(e) 4 yd. 1½ ft.
(f) ¼ mile.
(g) 165 yards.
(h) 174 inches.
(i) 160 rods.

Find the sum of the feet and change to rods.

Lesson LVII.

Change to quarts:

(a) 5 bu. 3 pk.
(b) 15 bushels.
(c) 3 pk. 7 qt.
(d) 7½ bushels.
(e) 14 pecks.
(f) 4 bu. 16 qt.
(g) 370 pints.
(h) 10¼ bushels.
(i) 8 bu. 3 pk.

Find the sum of the quarts and change to bushels.

Lesson LVIII.

Coal. Change to tons:

(a) 3460 lb.
(b) 5250 lb.
(c) 4390 lb.
(d) 6540 lb.
(e) 4750 lb.
(f) 5610 lb.
(g) 1350 lb.
(h) 8650 lb.
(i) 10,000 lb.

Find the cost at $6 *a ton.*

Lesson LIX.

Old Iron. Change to pounds:

(a) 2.46 tons.	(b) 3.34 tons.	(c) 2.7 tons.
(d) 3.56 tons.	(e) 1.18 tons.	(f) 5.3 tons.
(g) 1.36 tons.	(h) 3.24 tons.	(i) 2.9 tons.

Find the cost at $\frac{1}{2}$¢ a pound.

Lesson LX.

Oats. Change to bushels:

(a) 1360 lb.	(b) 2160 lb.	(c) 3280 lb.
(d) 1120 lb.	(e) 2240 lb.	(f) 4260 lb.
(g) 2120 lb.	(h) 3160 lb.	(i) 2220 lb.

Find the cost at 24¢ a bushel.

Lesson LXI.

Wheat. Change to bushels:

(a) 2140 lb.	(b) 3620 lb.	(c) 2540 lb.
(d) 1460 lb.	(e) 3720 lb.	(f) 2150 lb.
(g) 1240 lb.	(h) 4260 lb.	(i) 3240 lb.

Find the cost at 90¢ a bushel.

Lesson LXII.

Shelled Corn. Change to bushels:

(a) 3260 lb.	(b) 1240 lb.	(c) 2180 lb.
(d) 2670 lb.	(e) 3150 lb.	(f) 2290 lb.
(g) 2140 lb.	(h) 3210 lb.	(i) 4000 lb.

Find the cost at 28¢ a bushel.

Lesson LXIII.

Lumber. Find the cost at $15 per M.:

(a) 40 pcs. 2 × 4, 12.
(b) 40 pcs. 2 × 4, 14.
(c) 40 pcs. 2 × 4, 16.
(d) 40 pcs. 2 × 4, 18.
(e) 40 pcs. 4 × 4, 12.
(f) 40 pcs. 4 × 4, 14.
(g) 40 pcs. 4 × 4, 16.
(h) 40 pcs. 4 × 4, 18.
(i) 40 pcs. 2 × 6, 12.
(j) 40 pcs. 2 × 6, 14.

Find the total cost.

Lesson LXIV.

Lumber. Find the cost at $16 per M.:

(a) 20 pcs. 2 × 8, 12.
(b) 20 pcs. 2 × 10, 12.
(c) 20 pcs. 2 × 12, 12.
(d) 20 pcs. 2 × 8, 16.
(e) 20 pcs. 2 × 8, 18.
(f) 20 pcs. 4 × 8, 12.
(g) 20 pcs. 4 × 10, 12.
(h) 20 pcs. 4 × 12, 12.
(i) 20 pcs. 6 × 6, 14.
(j) 20 pcs. 8 × 8, 16.

Find the total cost.

Lesson LXV.

Lumber. Find the cost:

(a) 25 16-ft. stock boards at $18 per M.
(b) 35 14-ft. stock boards at $16 per M.
(c) 45 16-ft. fence boards at $14 per M.
(d) 2600 ft. common boards at $14½ per M.
(e) 8 M. cedar shingles @ $2.50 per M.
(f) 2460 ft. fencing flooring @ $20 per M.
(g) 1240 ft. clear white pine @ $45 per M.
(h) 80 feet black walnut @ $60 per M.

Find the total cost.

Lesson LXVI.

Land. Find the cost at $200 per acre:

(a) 40 rd. by 13 rd.
(b) 18 rd. by 30 rd.
(c) 20 rd. by 24 rd.
(d) 25 rd. by 80 rd.
(e) 32 rd. by 27 rd.
(f) 16 rd. by 35 rd.
(g) 24 rd. by 10 rd.
(h) 45 rd. by 8 rd.
(i) 12 rd. by 5 rd.
(j) 1 rd. by 4 rd.

Find the total cost.

Lesson LXVII.

Land. Find the cost at $5 per acre:

(a) One section.
(b) 4 rd. by 1 mile.
(c) 1 rd. by 6 miles.
(d) $\frac{1}{2}$ of a $\frac{1}{4}$ section.
(e) 1 mi. by 1 mi.
(f) One quarter section.
(g) 2 rd. by $\frac{1}{2}$ mile.
(h) 66 ft. by $\frac{1}{4}$ mile.
(i) $\frac{1}{4}$ of a $\frac{1}{4}$ section.
(j) $\frac{1}{4}$ mi. by $\frac{1}{2}$ mi.

Find the total cost.

Lesson LXVIII.

A Farm. Find the number of acres in each piece of Mr. A's farm, which is in section No. 20 and described as follows:

(a) The south $\frac{1}{2}$ of the northeast $\frac{1}{4}$ of the section.
(b) The north $\frac{1}{2}$ of the southeast $\frac{1}{4}$ of the section.
(c) The southeast $\frac{1}{4}$ of the northwest $\frac{1}{4}$ of the section.
(d) The northeast $\frac{1}{4}$ of the southwest $\frac{1}{4}$ of the section.
(e) The south $\frac{1}{2}$ of the southwest $\frac{1}{4}$ of the northwest $\frac{1}{4}$.
(f) The north $\frac{1}{2}$ of the northwest $\frac{1}{4}$ of the southwest $\frac{1}{4}$.
(g) Make a diagram of the farm and find its value at $25 per acre.

Lesson LXIX.

Wood. Find the value at $4 per cord:

(a) 8 ft. by 4 ft. by 12 ft.
(b) 10 ft. by 8 ft. by 20 ft.
(c) 5 ft. by 12 ft. by 32 ft.
(d) 12 ft. by 6 ft. by 48 ft.
(e) 2 ft. by 8 ft. by 8 ft.
(f) 12 ft. by 6 ft. by 16 ft.
(g) 4 ft. by 6 ft. by 56 ft.
(h) 7 ft. by 8 ft. by 32 ft.
(i) 8 ft. by 8 ft. by 8 ft.
(j) 1 ft. by 4 ft. by 8 ft.

Find the total value.

Lesson LXX.

Brick. Find the value at $6 per M.:

(a) 2640 bricks.
(b) 2870 bricks.
(c) 5260 bricks.
(d) 1870 bricks.
(e) 8760 bricks.
(f) 7360 bricks.
(g) 7130 bricks.
(h) 4740 bricks.
(i) 8130 bricks.
(j) 1240 bricks.

Find the total value.

Lesson LXXI.

Miscellaneous. Find the value:

(a) 2480 lb. oats at 16¢ a bushel.
(b) 2480 lb. coal at $4.50 per ton.
(c) 2480 lb. beef at $6.50 per cwt.
(d) 2480 ft. lumber at $15.50 per M.
(e) 2480 quarts milk at 14 cents a gallon.
(f) 2480 lb. wheat at 75¢ a bushel.
(g) 2480 bricks at $5.50 per M.
(h) 2480 lb. of old iron at ½¢ a pound.

Find the total value.

Lesson LXXII.

Cattle. Find the value at $4.50 per cwt.:

(a) 7240 lb.	(b) 2760 lb.	(c) 3250 lb.
(d) 6750 lb.	(e) 4160 lb.	(f) 5840 lb.
(g) 3720 lb.	(h) 6280 lb.	(i) 6000 lb.

Find the total value.

Lesson LXXIII.

Hay and **Straw.** Find the cost:

Commodity.	Gross weight.	Tare.	Price.
(a) Timothy Hay.	4380 lb.	1260 lb.	$12 per ton.
(b) Wild Hay.	4520 lb.	1260 lb.	$7 per ton.
(c) Rye Straw.	3740 lb.	1260 lb.	$6 per ton.
(d) Oat Straw.	3620 lb.	1260 lb.	$4 per ton.
(e) Clover Hay.	3870 lb.	1260 lb.	$9 per ton.

Find the total cost.

Lesson LXXIV.

Hogs. Find the value at $3.50 per cwt.:

(a) 4260 lb.	(b) 5740 lb.	(c) 3220 lb.
(d) 6780 lb.	(e) 8320 lb.	(f) 1680 lb.
(g) 5940 lb.	(h) 4060 lb.	(i) 4000 lb.

Find the total value.

Lesson LXXV.

Milk. Find the value at $1.25 per cwt.:

(a) 1240 lb.	(b) 2560 lb.	(c) 1720 lb.
(d) 1560 lb.	(e) 1920 lb.	(f) 1328 lb.
(g) 1624 lb.	(h) 1080 lb.	(i) 1448 lb.

Find the total value.

Lesson LXXVI.

Miscellaneous. Find the value:

(a) 3840 lb. fence wire at $3.50 per cwt.
(b) 3840 lb. soft coal at $4.50 per ton.
(c) 3840 lb. pork at $5.00 per cwt.
(d) 3840 lb. clover seed * at $6.25 per bushel.
(e) 3840 feet pine lumber at $17 per M.
(f) 3840 lb. paper rags at $\frac{3}{4}¢$ per pound.
(g) 3840 eggs at 16¢ per dozen.
(h) 3840 lb. ice at 60¢ a hundredweight.

Find the total value.

Lesson LXXVII.

Rectangular Tanks. Find the approximate capacity in gallons:

(a) 3 ft. × 1 ft. × 2 ft.
(b) 2 ft. × 2 ft. × $2\frac{1}{2}$ ft.
(c) $2\frac{1}{2}$ ft. × 3 ft. × 4 ft.
(d) 1 ft. × 3 ft. × 10 ft.
(e) 2 ft. × 2 ft. × 2 ft.
(f) $1\frac{1}{2}$ ft. × 2 ft. × 2 ft.
(g) 2 ft. × 3 ft. × 4 ft.
(h) $1\frac{1}{3}$ ft. × 4 ft. × 6 ft.

Find the total capacity of the eight tanks.

Lesson LXXVIII.

Rectangular Tanks. Find the approximate capacity in barrels:

(a) 6 ft. × 4 ft. × 5 ft.
(b) 3 ft. × 4 ft. × 12 ft.
(c) 2 ft. × 4 ft. × 16 ft.
(d) 8 ft. × 8 ft. × 8 ft.
(e) 8 ft. × 2 ft. × 10 ft.
(f) 5 ft. × 2 ft. × 8 ft.
(g) 2 ft. × 3 ft. × 6 ft.
(h) 10 ft. × 10 ft. × 10 ft.

Find the total capacity of the eight tanks.

* 60 lb. clover seed in one bushel.

Lesson LXXIX.

Grain Bins. Find the capacity in bushels:

(a) 4 ft. × 6 ft. × 6 ft.
(b) 5 ft. × 5 ft. × 4 ft.
(c) 2 ft. × 2 ft. × 10 ft.
(d) 6 ft. × 7 ft. × 5 ft.
(e) 9 ft. × 9 ft. × 10 ft.
(f) 3 ft. × 3 ft. × 4 ft.
(g) $4\frac{1}{2}$ ft. × 6 ft. × 6 ft.
(h) $3\frac{1}{2}$ ft. × $3\frac{1}{2}$ ft. × 8 ft.
(i) $4\frac{1}{2}$ ft. × $4\frac{1}{2}$ ft. × 4 ft.
(j) $6\frac{1}{2}$ ft. × $6\frac{1}{2}$ ft. × 12 ft.

Find the total capacity of the ten bins.

Lesson LXXX.

Potato Bins. Find the capacity in bushels:

NOTE.—A bushel of potatoes (a heaped bushel) occupies $1\frac{1}{4}$ cubic feet.

(a) 2 ft. × 2 ft. × 10 ft.
(b) 3 ft. × 3 ft. × 8 ft.
(c) 4 ft. × 3 ft. × 6 ft.
(d) 5 ft. × 4 ft. × 10 ft.
(e) 9 ft. × 9 ft. × 12 ft.
(f) $2\frac{1}{2}$ ft. × $2\frac{1}{3}$ ft. × 6 ft.
(g) $3\frac{1}{4}$ ft. × $4\frac{1}{2}$ ft. × 8 ft.
(h) $4\frac{1}{3}$ ft. × $2\frac{1}{2}$ ft. × 6 ft.
(i) $5\frac{3}{4}$ ft. × $4\frac{1}{2}$ ft. × 8 ft.
(j) $3\frac{2}{3}$ ft. × $5\frac{1}{2}$ ft. × 12 ft.

Find the total capacity of the ten bins.

Lesson LXXXI.

Corn Cribs. Find the capacity in bushels:

NOTE.—Ear corn sufficient to make one bushel of shelled corn, occupies $2\frac{1}{2}$ cubic feet. Hence a crib will contain $\frac{2}{5}$ as many bushels as there are cubic feet.†

(a) 8 ft. × 8 ft. × 30 ft.
(b) 8 ft. × 9 ft. × 50 ft.
(c) 8 ft. × 8 ft. × 60 ft.
(d) 8 ft. × 7 ft. × 70 ft.
(e) 8 ft. × $9\frac{1}{2}$ ft. × 50 ft.
(f) 8 ft. × 8 ft. × 40 ft.
(g) 8 ft. × 10 ft. × 35 ft.
(h) 9 ft. × 10 ft. × 55 ft.
(i) 9 ft. × 12 ft. × 100 ft.
(j) 9 ft. × $10\frac{1}{2}$ ft. × 150 ft.

Find the total capacity of the ten cribs.

† Some farmers call $2\frac{1}{2}$ cubic feet of ear corn one bushel, while others count 3900 cubic inches one bushel. The corn must be of excellent quality and well "settled" if $2\frac{1}{2}$ cubic feet make one bushel.

Lesson LXXXII.

Circles. Find the circumference, the diameter being given:*

(a) 21 in. (b) 14 ft. (c) 35 yd. (d) 98 rd. (e) 1680 ft.
(f) 24 in. (g) 30 ft. (h) 40 yd. (i) 100 rd. (j) 2000 ft.

Lesson LXXXIII.

Circles. Find the area, the diameter being given:

(a) 25 in. (b) 6 ft. (c) 8 yd. (d) 12 rd. (e) 1 mile.
(f) 50 in. (g) 12 ft. (h) 16 yd. (i) 24 rd. (j) 2 miles.

Lesson LXXXIV.

Spheres. Find the solid content, the diameter being given:

(a) 4 in. (b) 5 in. (c) 6 ft. (d) 12 in. (e) 15 cm.
(f) 8 in. (g) 10 in. (h) 12 ft. (i) 24 in. (j) 30 cm.

NOTE.—Compare the answers to (a) and (f) in Lesson LXXXIII, and the answers to (a) and (f) in Lesson LXXXIV.

Lesson LXXXV.

Square Root.

(a) $\sqrt{1296}$ (b) $\sqrt{729}$ (c) $\sqrt{2025}$ (d) $\sqrt{1089}$
(e) $\sqrt{\frac{144}{225}}$ (f) $\sqrt{\frac{121}{400}}$ (g) $\sqrt{\frac{225}{324}}$ (h) $\sqrt{\frac{169}{625}}$
(i) $\sqrt{2.25}$ (j) $\sqrt{4.84}$ (k) $\sqrt{1.21}$ (l) $\sqrt{2.56}$

* The circumference of a circle is a little more than three times the diameter; more accurately, it is 3.14 times the diameter; yet more accurately, it is $3\frac{1}{7}$ times the diameter. Regard $3\frac{1}{7}$ as the ratio of circumference to diameter in the solution of these problems.

Lesson LXXXVI.

Per cent. CASE I.

(a) Find 27 % of £30.
(b) Find 32 % of 726.
(c) Find 43 % of 965.
(d) Find 34⅓ % of 642.
(e) Find 23⅛ % of 522.
(f) Find 73 % of 830.
(g) Find 68 % of 726.
(h) Find 57 % of 965.
(i) Find 65½ % of 642.
(j) Find 76⅜ % of 522.

Find the sum of the ten answers.

Lesson LXXXVII.

Per cent. CASE II.

(a) 84 is 7 % of what?
(b) 92 is 8 % of what?
(c) 72 is 5 % of what?
(d) 63 is 2 % of what?
(e) 86 is 4 % of what?
(f) 360 is 15 % of what?
(g) 527 is 17 % of what?
(h) 480 is 32 % of what?
(i) 432 is 18 % of what?
(j) 598 is 26 % of what?

Find the sum of the ten answers.

Lesson LXXXVIII.

Per cent. CASE III.

(a) 48 is what per cent of 1200?
(b) 43 is what per cent of 860?
(c) 60 is what per cent of 750?
(d) 27 is what per cent of 450?
(e) 117 is what per cent of 780?
(f) 247 is what per cent of 950?
(g) 287 is what per cent of 820?
(h) 154 is what per cent of 550?

Lesson LXXXIX.

Per cent. CASE I.

(a) Find 8 % of $325.60.
(b) Find 15½ % of $325.60.
(c) Find 17½ % of $325.60.
(d) Find 12½ % of $978.40.
(e) Find 16⅔ % of $253.20.
(f) 35 % of $325.60.
(g) 24 % of $325.60.
(h) 37½ % of $978.40.
(i) 33⅓ % of $253.20.
(j) 75 % of $573.60.

Find the sum of the ten answers.

Lesson XC.

Per cent. CASE II.

(a) $39.20 is 7 % of what?
(b) $34.40 is 8 % of what?
(c) $22.50 is 6 % of what?
(d) $31.40 is 5 % of what?
(e) $30.60 is 9 % of what?
(f) $750 is 25 % of what?
(g) $325 is 33⅓ % of what?
(h) $562 is 66⅔ % of what?
(i) $735 is 75 % of what?
(j) $360 is 37½ % of what?

Find the sum of the ten answers.

Lesson XCI.

Per cent. CASE III.

(a) $51.92 is what per cent of $324.50?
(b) $41.34 is what per cent of $275.60?
(c) $104.50 is what per cent of $836?
(d) $115.01 is what per cent of $742?
(e) $143.50 is what per cent of $574?
(f) $153.30 is what per cent of $438?
(g) $168.39 is what per cent of $374.20?
(h) $104.37 is what per cent of $248.50?

Lesson XCII.

Interest. Find the interest at 6 %:

(a) On $320 for 2 yr. 2 mo.
(b) On $250 for 1 yr. 5 mo.
(c) On $340 for 2 yr. 1 mo.
(d) On $275 for 1 yr. 4 mo.
(e) On $562 for 2 yr. 3 mo.
(f) On $320 for 1 yr. 10 mo.
(g) On $250 for 2 yr. 7 mo.
(h) On $340 for 1 yr. 11 mo.
(i) On $275 for 1 yr. 8 mo.
(j) On $562 for 2 yr. 9 mo.

Find the sum of the ten answers.

Lesson XCIII.

Interest. Find the interest at 6 %:

(a) On $240 for 6 mo. 10 da.
(b) On $360 for 4 mo. 12 da.
(c) On $236 for 8 mo. 15 da.
(d) On $315 for 2 mo. 8 da.
(e) On $600 for 10 mo. 1 da.
(f) On $240 for 5 mo. 20 da.
(g) On $360 for 7 mo. 18 da.
(h) On $236 for 3 mo. 15 da.
(i) On $315 for 9 mo. 22 da.
(j) On $600 for 1 mo. 29 da.

Find the sum of the ten answers.

Lesson XCIV.

Interest. Find the amount:

(a) Of $320 for 1 yr. 7 mo. 6 da. at 6 %.
(b) Of $320 for 1 yr. 4 mo. 24 da. at 6 %.
(c) Of $246 for 1 yr. 5 mo. 12 da. at 7 %.*
(d) Of $246 for 1 yr. 6 mo. 18 da. at 7 %.
(e) Of $352 for 1 yr. 3 mo. 10 da. at 8 %.†
(f) Of $352 for 1 yr. 8 mo. 20 da. at 8 %.
(g) Of $234 for 1 yr. 7 mo. 13 da. at 6 %.
(h) Of $234 for 1 yr. 4 mo. 17 da. at 6 %.

* Take $\frac{7}{8}$ of the interest at 6 %. † Take $\frac{2}{3}$ of the interest at 6 %.

Lesson XCV.

Interest. Find the amount at 6 %:

(a) Of $324.50 from Jan. 1, 1896, to May 1, 1897.
(b) Of $275.30 from Feb. 1, 1896, to Aug. 1, 1897.
(c) Of $442.50 from March 12, 1896, to Dec. 22, 1897.
(d) Of $136.40 from April 10, 1896, to Sept. 28, 1897.
(e) Of $233.70 from June 20, 1896, to Oct. 5, 1897.

Lesson XCVI.

Interest. Find the amount at 7 %:

(a) Of $235.20 from Jan. 8, 1896, to May 8, 1897.
(b) Of $346.50 from Feb. 12, 1896, to Aug. 12, 1897.
(c) Of $134.30 from March 15, 1896, to May 25, 1897.
(d) Of $425.40 from April 4, 1896, to Oct. 10, 1897.
(e) Of $315.60 from June 25, 1896, to Sept. 10, 1897.

Lesson XCVII.

Bank Discount. Rate 6 %. Find the proceeds:*

(a) Face of note, $500; time, 30 da. (b) $300, 60 days.
(c) Face of note, $400; time, 60 da. (d) $200, 30 days.
(e) Face of note, $350; time, 60 da. (f) $220, 30 days.

Lesson XCVIII.

Bank Discount. Rate 7 %. Find the proceeds:*

(a) Note, $300; discounted, Jan. 10; matured, Feb. 10.
(b) Note, $240; discounted, Apr. 15; matured, June 15.
(c) Note, $150; discounted, May 18; matured, June 18.
(d) Note, $500; discounted, June 12; matured, July 27.
(e) Note, $400; discounted, July 5; matured, Aug. 17.

* The notes mentioned in Lessons XCVII. and XCVIII. bear no interest if paid at maturity.

Lesson XCIX.

Partial Payments.

$1000. WAUKEGAN, Ill., Jan. 1, 1895.

For value received, on or before the first day of January, 1897, I promise to pay to Hiram Morris, or order, One Thousand Dollars, with interest at the rate of six per cent per annum until paid.

ANDREW JACKSON.

Upon the back of this note appear the following:

Received July 1st, 1895, Two Hundred Dollars.
Received Dec. 1, 1895, Three Hundred Dollars.
Received May 1, 1896, Four Hundred Dollars.

(a) Find the amount due on the above note, Jan. 1, 1897.

Lesson C.

(a) Any sum of money loaned at 8 % per annum and the interest collected every six months and loaned at the same rate, will a little more than double itself in 9 years. Regarding it as exactly doubling itself in 9 years, $5000 so loaned and the interest so collected and loaned, will amount to how much in 99 years?

NOTE.—Money loaned at 6 % and the interest collected annually and loaned at the same rate, doubles itself in a little less than 12 years.

ANSWERS TO PROBLEMS

IN

SUPPLEMENTARY "SEAT WORK."

I.

a 328
b 152
c 2325
d 21382
e 223471
f 513
g 487
h 426
i 574
j 500

250158

II.

a 156
b 144
c 6366
d 5564
e 24281
f 166
g 448
h 3829
i 2495
j 21426

64875

III.

a 9762
b 16270
c 6748
d 7617
e 13185
f 26032
g 13016
h 10122
i 17773
j 76815

197340

IV.

a 8190
b 8748
c 8815
d 31124
e 22606
f 26810
g 18252
h 32185
i 30876
j 66394

254000

V.

a 23750
b 33250
c 22080
d 29440
e 5160
f 285000
g 133000
h 147200
i 169280
j 123840

972000

VI.

a 21480
b 14320
c 10740
d 8592
e 7160
f 6255
g 6467
h 3965
i 3278
j 3522

85779

VII.

a 12053
b 2738
c 9007
d 3121
e 1652

f 6432
g 31750
h 840
i 4451
j 3226
75270

VIII.

a 1370
b 1242
c 2431
d 3142
e 1527
f 2134
g 1326
h 2614
i 2535
j 1234
19555

IX.

a 358
b 341
c 326
d 236
e 391
f 126
g 251
h 176
i 130
j 226
2561

X.

a 8000
b 4000
c 400
d 800
e 2000
f 200
g 40
h 10
i 500000
j 125000
640450

XI.

a $1\frac{13}{20}$
b $1\frac{3}{4}$
c $1\frac{19}{60}$
d $\frac{21}{30}$
e $1\frac{13}{30}$
f $1\frac{11}{20}$
g $1\frac{7}{12}$
h $1\frac{53}{60}$
i $2\frac{9}{30}$
j $1\frac{23}{30}$
$15\frac{14}{15}$

XII.

a $1\frac{59}{120}$
b $\frac{14}{15}$
c $2\frac{3}{20}$
d $\frac{41}{60}$
e $1\frac{49}{60}$
f $1\frac{61}{120}$
g $2\frac{17}{30}$
h $\frac{19}{20}$
i $2\frac{19}{60}$
j $1\frac{23}{60}$
$15\frac{4}{5}$

XIII.

a 72
b 315
c 84
d 360
e 450
f 360
g 600
h 168
i 960
j 360
3729

XIV.

a $\frac{43}{72}$
b $\frac{7}{8}$
c $\frac{47}{72}$
d $\frac{71}{144}$
e $\frac{47}{144}$
f $\frac{41}{72}$
g $\frac{71}{72}$
h $\frac{23}{72}$
i $1\frac{111}{144}$
j $1\frac{5}{48}$
7

XV.

a $\frac{143}{180}$
b $1\frac{1}{90}$
c $\frac{89}{90}$

d $\frac{137}{180}$
e $1\frac{1}{6}$
f $\frac{89}{90}$
g $1\frac{1}{90}$
h $1\frac{43}{180}$
i $1\frac{37}{180}$
j $\frac{4}{5}$

10

XVI.

a $\frac{1}{30}$
b $\frac{7}{30}$
c $\frac{43}{60}$
d $\frac{21}{40}$
e $\frac{23}{30}$
f $\frac{1}{6}$
g $\frac{4}{15}$
h $\frac{7}{40}$
i $\frac{3}{10}$
j 1

4

XVII.

a $\frac{23}{75}$
b $\frac{31}{150}$
c $\frac{14}{75}$
d $\frac{9}{30}$
e $\frac{1}{30}$
f $\frac{43}{75}$
g $\frac{91}{150}$
h $\frac{3}{25}$
i $\frac{20}{30}$
j $\frac{1}{2}$

$3\frac{1}{2}$

XVIII.

a $\frac{23}{72}$
b $\frac{29}{72}$
c $\frac{5}{18}$
d $\frac{7}{30}$
e $\frac{37}{90}$
f $\frac{13}{60}$
g $\frac{13}{60}$
h $\frac{17}{30}$
i $\frac{4}{15}$
j $\frac{4}{45}$

3

XIX.

a 161
b 207
c 92
d 69
e 230
f 184
g 115
h 46
i $761\frac{2}{5}$
j $507\frac{3}{5}$

2373

XX.

a $224\frac{3}{8}$
b $209\frac{5}{12}$
c $164\frac{13}{24}$
d $118\frac{2}{7}$
e $110\frac{2}{5}$
f $299\frac{1}{6}$
g $201\frac{5}{16}$
h $336\frac{9}{16}$
i $73\frac{1}{36}$
j $39\frac{3}{7}$

1712

XXI.

a $\frac{35}{117}$
b $\frac{21}{195}$
c $\frac{28}{117}$
d $\frac{14}{195}$
e $\frac{133}{585}$
f $\frac{7}{39}$
g $\frac{77}{585}$
h $\frac{14}{117}$
i $\frac{14}{39}$
j $\frac{49}{117}$

$2\frac{2}{13}$

XXII.

a $578\frac{1}{3}$
b 448
c 1859
d $1009\frac{2}{5}$
e $462\frac{2}{3}$
f 576
g 2197
h $1153\frac{3}{5}$
i $730\frac{1}{2}$
j $1217\frac{1}{3}$

10232

XXIII.

a $\frac{3}{20}$
b $\frac{7}{60}$

c $\frac{1}{20}$
d $\frac{11}{20}$
e $\frac{2}{15}$
f $\frac{7}{20}$
g $\frac{7}{60}$
h $\frac{3}{10}$
i $\frac{7}{30}$
j $\frac{7}{20}$

$2\frac{7}{20}$

XXIV.

a $2\frac{1}{10}$
b $3\frac{3}{4}$
c $1\frac{3}{4}$
d $\frac{11}{20}$
e $\frac{7}{30}$
f $3\frac{3}{10}$
g $5\frac{5}{12}$
h $2\frac{3}{4}$
i $\frac{13}{20}$
j $\frac{7}{15}$

$20\frac{29}{30}$

XXV.

a $261\frac{4}{7}$
b $568\frac{25}{28}$
c $587\frac{2}{7}$
d $754\frac{23}{28}$
e $295\frac{3}{8}$
f $377\frac{53}{56}$
g $566\frac{5}{8}$
h $286\frac{45}{56}$
i $184\frac{7}{8}$
j $324\frac{1}{2}$

$4208\frac{39}{56}$

XXVI.

a $123\frac{9}{10}$
b $448\frac{53}{60}$
c $549\frac{8}{15}$
d $384\frac{3}{10}$
e $865\frac{19}{20}$
f $186\frac{5}{6}$
g $154\frac{13}{30}$
h $345\frac{11}{20}$
i $673\frac{4}{5}$
j $546\frac{9}{10}$

$4280\frac{1}{30}$

XXVII.

a $171\frac{3}{5}$
b $275\frac{1}{10}$
c $167\frac{2}{5}$
d 206
e $111\frac{3}{10}$
f $139\frac{1}{5}$
g $236\frac{1}{4}$
h $286\frac{1}{5}$
i $117\frac{3}{5}$
j $139\frac{3}{4}$

$1850\frac{2}{5}$

XXVIII.

a $750\frac{3}{4}$
b $1765\frac{1}{2}$
c $3242\frac{2}{3}$
d $595\frac{5}{6}$
e $1097\frac{1}{4}$
f $2086\frac{1}{2}$
g $3445\frac{1}{3}$
h $1054\frac{1}{6}$
i $3327\frac{1}{2}$
j $302\frac{1}{2}$

17668

XXIX.

a $1460\frac{1}{4}$
b $526\frac{1}{6}$
c $1716\frac{13}{24}$
d $727\frac{1}{12}$
e $1512\frac{7}{24}$
f $1784\frac{3}{4}$
g $826\frac{5}{6}$
h $1452\frac{11}{24}$
i $668\frac{1}{12}$
j $3672\frac{17}{24}$

14348

XXX.

a $27\frac{9}{10}$
b $35\frac{3}{20}$
c $18\frac{11}{20}$
d $18\frac{7}{10}$
e $18\frac{7}{10}$
f $21\frac{7}{10}$
g $16\frac{13}{20}$
h $29\frac{3}{20}$
i $11\frac{1}{20}$
j $32\frac{3}{10}$

$229\frac{17}{20}$

XXXI.

a $109\frac{3}{5}$
b $112\frac{1}{3}$
c $34\frac{2}{15}$
d 255
e $164\frac{2}{5}$
f $262\frac{1}{2}$
g $221\frac{1}{15}$
h 170
i $68\frac{2}{5}$
j $359\frac{3}{5}$

1758

XXXII.

a $173\frac{4}{5}$
b $57\frac{4}{15}$
c $114\frac{4}{15}$
d $72\frac{3}{16}$
e $82\frac{1}{2}$
f $115\frac{3}{15}$
g $143\frac{2}{3}$
h $28\frac{1}{15}$
i $41\frac{1}{4}$
j $20\frac{5}{8}$

$851\frac{119}{240}$

XXXIII.

a $188\frac{1}{2}$
b $82\frac{1}{3}$
c $223\frac{3}{4}$
d $64\frac{4}{5}$
e $20\frac{5}{6}$
f 82
g 48
h 32
i $34\frac{3}{5}$
j $36\frac{1}{3}$

$813\frac{3}{20}$

XXXIV.

a $\frac{257}{3}$
b $\frac{307}{4}$
c $\frac{271}{7}$
d $\frac{187}{5}$
e $\frac{193}{2}$
f $\frac{763}{8}$
g $\frac{283}{6}$
h $\frac{524}{9}$
i $\frac{723}{10}$
j $\frac{1091}{12}$

2520

XXXV.

a $\frac{2}{3}$
b $\frac{3}{4}$
c $\frac{6}{7}$
d $\frac{2}{5}$
e $\frac{1}{2}$
f $\frac{3}{8}$
g $\frac{1}{6}$
h $\frac{2}{9}$
i $\frac{3}{10}$
j $\frac{5}{12}$

$4\frac{2}{3}\frac{8}{2}\frac{9}{0}$

XXXVI.

a $\frac{1}{2}$
b $\frac{3}{10}$
c $3\frac{3}{5}$
d $\frac{1}{3}$
e $1\frac{1}{2}$
f $1\frac{2}{5}$
g 1
h $\frac{4}{5}$
i $3\frac{3}{5}$
j $7\frac{1}{3}$

$20\frac{3}{40}$

XXXVII.

a $\frac{1}{2}$
b $\frac{2}{3}$
c $\frac{11}{20}$
d $\frac{3}{5}$
e $\frac{2}{3}$
f $\frac{3}{5}$
g $\frac{5}{6}$
h $\frac{4}{5}$
i $\frac{1}{2}$
j $\frac{2}{3}$

$6\frac{19}{120}$

XXXVIII.

a 616.025
b 15.7
c 110.57
d 25.369
e 251.34
f 24.4048
g 3.750078
h 4704.62
i .444444
j 73

5825.223322

XXXIX.

a 7.271
b 40.06
c 837.4573
d 3.2773
e 406.6
f 45.325
g 1.771
h 582.125
i 999.766
j 9.9564

2933.609

XL.

a 87.2
b 69.76
c 30.52
d 2.18
e 54.5
f 13.08
g 104.64
h 34.88
i 10.9
j 28.34

436

XLI.

a 86.25
b 10.144
c 847.4
d 96.292
e 1411.54
f 201.25
g 15.216
h 3389.6
i 157.108
j 4017.46

10232.26

XLII.

a 92.502
b 91.368
c 15.417
d 163.625
e 826.94
f 250.098
g 162.432
h 18.843
i 221.375
j 1563.06

3405.66

XLIII.

a 4320
b 1440
c 496
d 38
e 5462.5
f 2880
g 1744
h 142
i 17920
j 575

35017.5

XLIV.

a 139.37
b 122.336
c 57.6
d 45.39
e 24.334
f 57.45
g 68.4068
h 125.825
i 63.12
j 29.805

733.6368

XLV.

a 15.02
b 184.9
c 114.6
d 15250
e 11.03
f 150.2
g 1531
h 11.45
i 1.931
j 12580

29850.131

XLVI.

a .875
b .75
c .625
d .25
e .375
f .075
g .125
h .175
i .55
j .2

4

XLVII.

a $\frac{1}{2}$
b $\frac{1}{8}$
c $\frac{3}{4}$
d $\frac{3}{8}$
e $\frac{5}{8}$
f $\frac{3}{10}$
g $\frac{1}{40}$
h $\frac{17}{20}$
i $\frac{7}{8}$
j $\frac{32}{40}$
$\frac{}{5}$

XLVIII.

a $\frac{1}{3}$
b $\frac{1}{7}$
c $\frac{2}{3}$
d $\frac{4}{7}$
e $\frac{2}{7}$
f $\frac{1}{6}$
g $\frac{2}{6}$
h $\frac{1}{3}$
i $\frac{4}{6}$
j $\frac{3}{6}$
$\frac{}{4}$

XLIX.

a 11 bu. 3 pk. 5 qt.
b 15 yd. 1 ft.
c 49 lb. 5 oz.
d 10 T. 1090 lb.
e 9 A. 103 rd.
f 17 gal. 3 qt.

L.

a 4 bu. 2 pk. 4 qt.
b 4 yd. 1 ft. 9 in.
c 3 sq. ft. 120 sq. in.
d 2 cu. ft. 1209 cu. in.
e 2 gal. 3 qt.
f 6 cd. 96 cu ft.

LI.

a 13 hr. 1 min. 40 sec.
b 76 yd. 1 ft.
c 13 T. 250 lb.
d 103 bu. 1 pk.
e 141 lb. 12 oz.
f 26 mi. 80 rd.
g 24 cd. 64 cu. ft.
h 37 sq. ft. 72 sq. in.
i 101 wk. 5 da.
j 16 A. 56 sq. rd.

LII.

a 4 T. 990 lb.
b 9 bu. 1 pk.
c 5 gal. 2 qt.
d 3 A. 50 sq. rd.
e 2 hr. 35 min.
f 2 cu. ft. 192 cu. in.
g 5 pk. 3 qt.
h 28 mi. 200 rd.
i 1 sq. ft. 54 sq. in.
j 3 lb. 5 oz.

LIII.

a 23 t's
b 84 "
c 43 "
d 48 "
e 39 "
f 14 "
g 37 "
h 39 "
i 77 "
j 181.5 t's

LIV.

a 6 ft. 2 in.
b 8 yd. 1 ft.
c 9 ft. 9 in.
d 7 yd. 2 ft.
e 11 yd. 1 ft. 8 in.
f 8 ft. 10 in.
g 12 yd. 2 ft.
h 14 ft. 3 in.
i 8 yd. 1 ft.
j 11 yd. 1 ft. 4 in.
$\frac{}{}$
73 yd.

LV.

a 6 pk. 6 qt.
b 3 bu. 1 pk.
c 2 pk.
d 4 bu. 2 pk.
e 7 bu. 1 pk. 5 qt.

f 5 pk. 2 qt.
g 3 bu. 3 pk.
h 2 pk.
i 4 bu. 2 pk.
j 7 bu. 2 pk. 3 qt.

35 bu.

LVI.

a 135 ft.
b 99 "
c $247\frac{1}{2}$ "
d $315\frac{1}{2}$ "
e $13\frac{1}{2}$ "
f 1320 "
g 495 "
h $14\frac{1}{2}$ "
i 2640 "

5280 ft. = 320 rd.

LVII.

a 184 qt.
b 480 "
c 31 "
d 240 "
e 112 "
f 144 "
g 185 "
h 328 "
i 280 "

1984 qt. = 62 bu.

LVIII.

a 1.73 T.
b 2.625 T.
c 2.195 "
d 3.27 "
e 2.375 "
f 2.805 "
g .675
h 4.325
i 5.

$150

LIX.

a 4920 lb.
b 6680 "
c 5400 "
d 7120 "
e 2360 "
f 10600 "
g 2720 "
h 6480 "
i 5800 "

$260.40

LX.

a $42\frac{1}{2}$ bu.
b $67\frac{1}{2}$ "
c $102\frac{1}{2}$ "
d 35 "
e 70 "
f $133\frac{1}{3}$ "
g $66\frac{1}{4}$ "
h $98\frac{3}{4}$ "
i $69\frac{3}{8}$ "

$164.40

LXI.

a $35\frac{2}{3}$ bu.
b $60\frac{1}{3}$ "
c $42\frac{1}{3}$ "
d $24\frac{1}{3}$ "
e 62 "
f $35\frac{5}{6}$ "
g $20\frac{2}{3}$ "
h 71 "
i 54 "

$365.55

LXII.

a $58\frac{3}{14}$
b $22\frac{1}{7}$
c $38\frac{3}{14}$
d $47\frac{9}{28}$
e $56\frac{1}{4}$
f $40\frac{6}{28}$
g $38\frac{3}{14}$
h $57\frac{9}{28}$
i $71\frac{3}{7}$

$120.70

LXIII.

a $4.80
b 5.40*
c 6.60*
d 7.20
e 9.60
f 11.20
g 12.60*
h 14.40

*See Werner Book II., page 215, foot-note.

i 7.20
j 8.40
$87.40

LXIV.

a $5.12
b 6.40
c 7.68
d 6.72
e 7.68
f 10.24
g 12.80
h 15.36
i 13.44
j 27.20
$112.64

LXV.

a $7.20
b 7.84
c 5.04
d 37.70
e 20.00
f 49.20
g 55.80
h 4.80
$187.58

LXVI.

a $650
b 675
c 600
d 2500
e 1080
f 700
g 300
h 450
i 75
j 5
$7035

LXVII.

a $3200
b 40
c 60
d 400
e 3200
f 800
g 10
h 10
i 200
j 400
$8320

LXVIII.

a 80 A.
b 80 "
c 40 "
d 40 "
e 20 "
f 20 "
g $7000

LXIX.

a $12
b 50
c 60
d 108
e 4
f 36
g 42
h 56
i 16
j 1
$385

LXX.

a $15.84
b 17.22
c 31.56
d 11.22
e 52.56
f 44.16
g 42.78
h 28.44
i 48.78
7.44
$300.00

LXXI.

a $12.40
b 5.58
c 161.20
d 38.44
e 86.80
f 31.00
g 13.64
h 12.40
$361.46

LXXII.

a $325.80
b 124.20
c 146.25
d 303.75
e 187.20

f 262.80
g 167.40
h 282.60
i 270.00
$2070.00

LXXIII.

a $18.72
b 11.41
c 7.44
d 4.72
e 11.74
$54.03

LXXIV.

a $149.10
b 200.90
c 112.70
d 237.30
e 291.20
f 58.80
g 207.90
h 142.10
i 140.00
$1540.00

LXXV.

a $15.50
b 32.00
c 21.50
d 19.50
e 24.00
f 16.60
g 20.30
h 13.50
i 18.10
$181.00

LXXVI.

a $134.40
b 8.64
c 192.00
d 400.00
e 65.28
f 28.80
g 51.20
h 23.04
$903.36

LXXVII.*

a 45 gal.
b 75 "
c 225 "
d 225 "
e 60 "
f 45 gal.
g 180 "
h 240 "
1095 gal.

LXXVIII.†

a $28\frac{4}{7}$ bbl.
b $34\frac{2}{7}$ "
c $30\frac{10}{21}$ "
d $121\frac{19}{21}$ "
e $38\frac{2}{21}$ "
f $19\frac{1}{21}$ "
g $8\frac{4}{7}$ "
h $238\frac{2}{21}$ "
$519\frac{1}{21}$ bbl.

LXXIX.‡

a $115\frac{1}{8}$ bu.
b 80 "
c 32 "
d 168 "
e 648 "
f $28\frac{4}{8}$ "
g $129\frac{3}{8}$ "
h $78\frac{2}{8}$ "
i $64\frac{4}{8}$ "

*These approximations are obtained by regarding a cubic foot as $7\frac{1}{2}$ gallons. The error is $4\frac{1}{2}$ cu. in., or $\frac{3}{1\,6\,4}$ of a gallon to each cubic foot, an insignificant amount in the measurement of water.

† These approximations are obtained by regarding a barrel as 4.2 cubic feet. The error is $4\frac{1}{2}$ cu. in., or $\frac{1}{1\,6\,1\,7}$ of a barrel, to the cubic foot.

‡ The answers given, are approximations obtained by regarding a bushel as $1\frac{1}{4}$ cubic feet.

j $405\frac{3}{8}$ bu.

$1750\frac{2}{5}$ bu.

LXXX.*

a $26\frac{2}{3}$ bu.
b 48 "
c 48 "
d $133\frac{1}{3}$ "
e 648 "
f $23\frac{1}{3}$ "
g 78 "
h $43\frac{1}{3}$ "
i 138 "
j $161\frac{1}{3}$ "

1348 bu.

LXXXI.

a $853\frac{1}{3}$ bu.
b 1600 "
c $1706\frac{2}{3}$ "
d $1742\frac{2}{3}$ "
e $1688\frac{2}{3}$ "
f $1337\frac{1}{3}$ "
g $1244\frac{4}{9}$ "
h 2200 "
i 4800 "
j 6300 "

$23473\frac{1}{3}$ bu.

LXXXII.

a 66 in.
b 44 ft.
c 110 yd.
d 308 rd.
e 5280 ft.
f $75\frac{3}{7}$ in.
g $94\frac{2}{7}$ ft.
h $125\frac{5}{7}$ yd.
i $314\frac{2}{7}$ rd.
j $6285\frac{5}{7}$ ft.

LXXXIII.†

a 490+ sq. in.
b 28+ sq. ft.
c 50+ sq. yd.
d 113+ sq rd.
e .785+ sq. mi.
f 1962+ sq. in.
g 113+ sq. ft.
h 200+ sq. yd.
i 452+ sq. rd.
j 3.14+ sq. mi.

LXXXIV.‡

a 33+ cu. in.
b 65+ cu. in.
c 113+ cu. ft.
d 904+ cu. in.
e 1767+ cc.
f 268+ cu. in.
g 523+ cu. in.
h 904+ cu. ft.
i 7238+ cu. in
j 14137+ cc.

LXXXV.

a 36
b 27
c 45
d 33
e $1\frac{2}{5}$
f $1\frac{1}{20}$
g $\frac{5}{6}$
h $\frac{13}{25}$
i 1.5
j 2.2
k 1.1
l 1.6

LXXXVI.

a 224.10
b 232.32
c 414.95
d 221.49
e 121.80

* The "*heaped bushel*" is a very inexact unit of measurement. The answers here given are based on the supposition that it equals $1\frac{1}{4}$ cubic feet. Theoretically it is 96 cubic inches more than $1\frac{1}{4}$ cubic feet. But for estimating the capacity of bins, the figures given are practically correct.

† These answers are obtained by using the ratio, .785.

‡ These answers are obtained by using the ratio, .5236.

f 605.90
g 493.68
h 550.05
i 420.51
j 400.20
3685.00

LXXXVII.

a 1200
b 1150
c 1440
d 3150
e 2150
f 2400
g 3100
h 1500
i 2400
j 2300
20790

LXXXVIII.

a 4%
b 5%
c 8%
d 6%
e 15%
f 26%
g 35%
h 28%

LXXXIX.

a $26.048
b 50.468
c 56.98
d 122.30
e 42.20
f 113.96
g 78.144
h 366.90
i 84.40
j 430.20
$1371.60

XC.

a $560
b 430
c 375
d 628
e 340
f 3000
g 975
h 843
i 980
j 960
$9091

XCI.

a 16%
b 15%
c 12½%
d 15½%
e 25%
f 35%
g 45%
h 42%

XCII.

a $41.60
b 21.25
c 42.50
d 22.00
e 75.87
f 35.20
g 38.75
h 39.10
i 27.50
j 92.73
$436.50

XCIII.

a $7.60
b 7.92
c 10.03
d 3.57
e 30.10
f 6.80
g 13.68
h 4.13
i 15.33
j 5.90
$105.06

XCIV

a $350.72
b 346.88
c 270.97
d 272.69
e 387.98
f 400.50
g 256.74
h 253.38
$2539.86

XCV.

a $350.46

b 300.08
c 489.70
d 148.40
e 251.81
$1540.45

XCVI.

a $257.15
b 382.88
c 145.53
d 470.56
e 342.36 *
$1598.48

XCVII.

a $497.50
b 297.00
c 396.00
d 199.00
e 346.50
f 218.90
$1954.90

XCVIII.

a $298.25
b 237.20
c 149.12
d 495.62
e 396.73
$1576.92

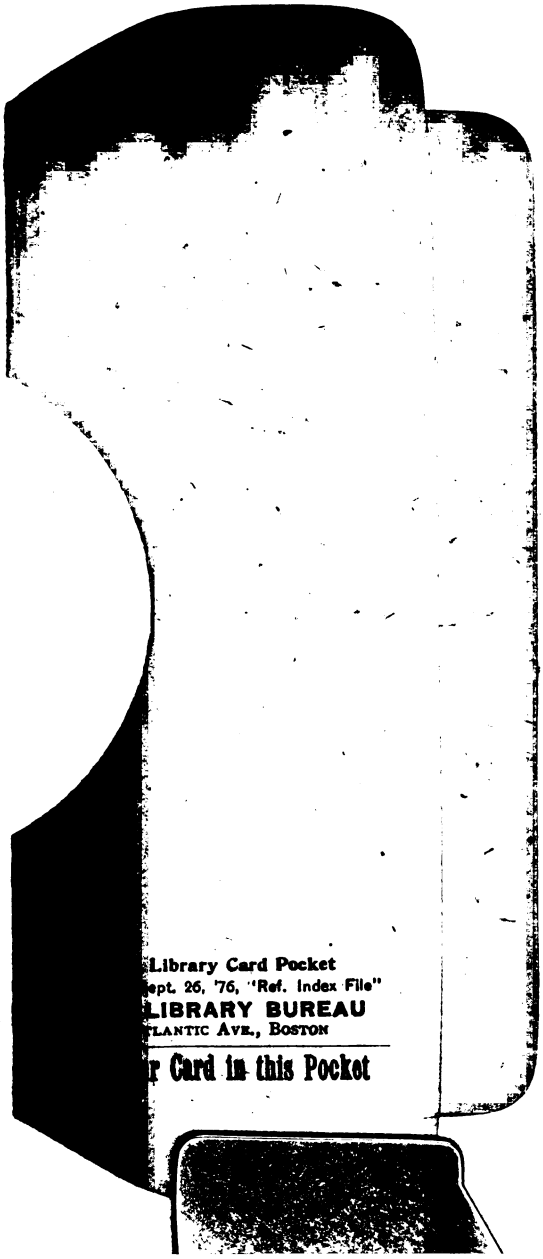
XCIX.

a $171.10

C.

a $10,240,000

* The time in this problem is 1 yr. 2 mo. 16 da.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